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- Italian F-35B debut
- Sea Breeze - Ukraine/US
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China – the new front line?

Governments around the world are spending billions, and in some cases trillions, supporting their populations and economies in these exceptional COVID times. This will inevitably lead to colossal cuts in all sorts of state-provided services, from health and education, to, yes, defence and the military.

Defence expenditure had already been scythed a decade ago in the UK, so it will be interesting to see what happens next. It's a tough call for NATO allies, as Putin's feistiness continues and the Chinese appear to become evermore expansionist and oppressive (at least if the western media is to be believed).

Military leaders will have some pretty formidable content for their Powerpoint presentations, when they head to their governments for more money, especially to fund enlarged or new bases with more aircraft in the Western Pacific and South China Sea.

Here, fast-growing Chinese forces and the US military are aggravating each other with large military exercises and shows of strength, but where will it all end? Rob Coppinger explores the Sino-US military build-up in Asia Pacific, to see if it could become the tinderbox for the next global conflagration, on page 34.

Meanwhile, presumably in an effort to implement more cost-cutting, the USAF is expanding its external contacts for firms to supply aggressor aircraft for training exercises. This isn't an entirely new thing, but the scale of the contracts is unprecedented.

Generally, these private firms supply outdated aircraft that are flown by highly experienced ex-forces pilots, which provides an 'enemy' for developing USAF pilots. When you see the cost of flying an F-35 or F-22 for an hour, you'll understand why they have taken this momentous step. But it isn't just about the

money. Find out all the details in Alan Warnes' excellent analysis, from page 28.

As well as 19 pages of the latest global military aviation news, this month's smorgasbord of fabulous flying machines, includes a stunning Luftwaffe Eurofighter that's all dressed up with nowhere to go, the next generation Merlin helicopter and an in-depth report on Russian UASs. Throw in Italian, Ukrainian and German/Israeli exercises, plus a fascinating look at Iran's unique 747 refuellers and we think this issue will keep you engrossed for some time.

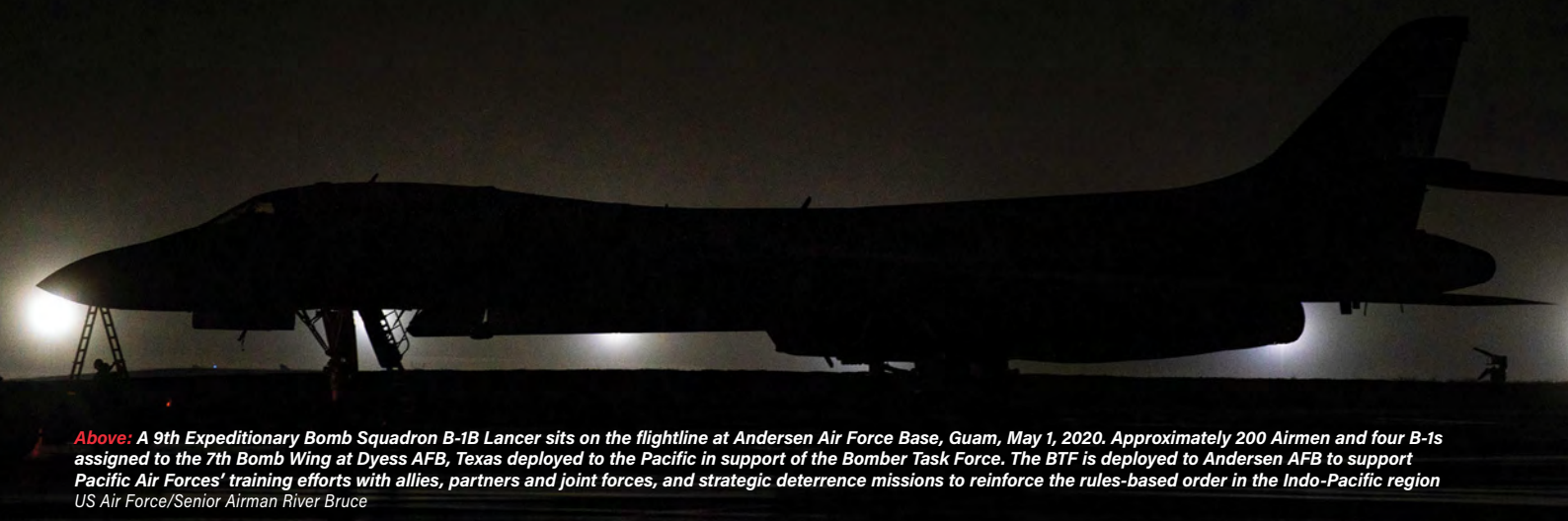
Enjoy.

John Sootheran



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Above: A 9th Expeditionary Bomb Squadron B-1B Lancer sits on the flightline at Andersen Air Force Base, Guam, May 1, 2020. Approximately 200 Airmen and four B-1s assigned to the 7th Bomb Wing at Dyess AFB, Texas deployed to the Pacific in support of the Bomber Task Force. The BTF is deployed to Andersen AFB to support Pacific Air Forces' training efforts with allies, partners and joint forces, and strategic deterrence missions to reinforce the rules-based order in the Indo-Pacific region US Air Force/Senior Airman River Bruce

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Associate Editor: Jake Hamilton
News Editor: Dave Allport
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Next Issue

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Cover: The Luftwaffe's 'Carbon Warrior' Eurofighter in special livery designed to celebrate 15 years of service in Germany Stefan Petersen Below: The Luftwaffe's 'The Sword of Boelcke' Eurofighter from TLG 31 Squadron during this summer's historic Blue Wings 2020 joint exercise with the Israeli Air Force Ben Gorski



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Rob Copping examines if the war of words between Washington and Beijing will escalate to a US-China conflict in the Indo-Pacific region

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In July, the US published its first Arctic strategy in the event of total war. Rob Copping explores warfare at the top of the world

44 Italy's proof of concept

In summer, the Italian Air Force demonstrated its rapid response capability during an exercise in the Mediterranean. Riccardo Niccoli reports

50 Germany unveils its 'Carbon Warrior' Eurofighter

The Luftwaffe loves decorating aircraft in special liveries to highlight anniversaries. Stefan Petersen reveals a Eurofighter decorated to celebrate 15 years of Luftwaffe service

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Alexander Mladenov charts the slow progress of Russia in implementing its unmanned aircraft systems. Can the cavernous gulf created by America's technological superiority be bridged by Russia's deadly, new stealth drone – the Sukhoi S-70

90 Iran's unique 747 tankers

Babak Taghvaei reports on these incredible 1970's Boeing 747 Persian refuellers, and how they simply keep on flying, despite the best bombing efforts of some countries



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This year's Sea Breeze exercise, between the US and the Ukraine, saw plenty of action in the Black Sea region. However, COVID-19 restrictions were clearly evident in the mock demonstrations, says Vladimir Trendafilovski

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See what's featuring in your *AFM* next month

First Islamic State strike for latest Rafale F3-R

FRENCH AIR Force Dassault Rafale F3-R standards carried out their first air strike against Daesh, also known as Islamic State (IS), on September 12, from their base in Jordan.

A Rafale patrol was carrying out early-morning aerial surveillance over Iraq and Syria for Opération Chammal, France's contribution to

the international anti-IS mission, Operation Inherent Resolve (OIR), which has 80 participating countries and organisations. At the request of OIR forces, the patrol carried out a bombing strike against a Daesh position. Daesh is the English pronunciation spelling for the Arabic acronym used for the full

Arabic title of the Islamic State, which is Islamic State in the Levant. Details of the French strike were not revealed until September 28.

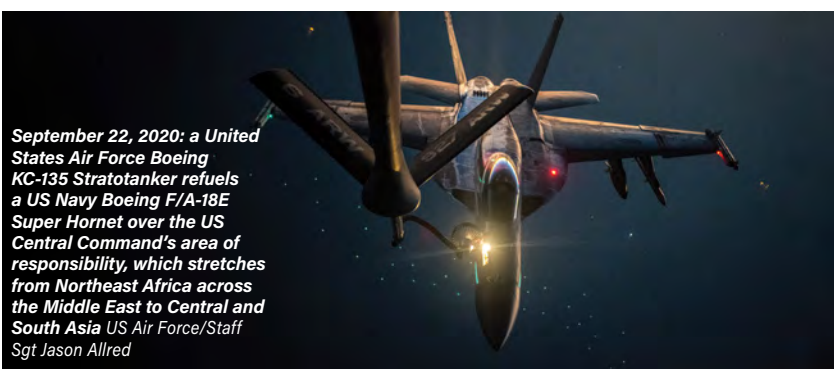
The French Ministry of Defence said in a statement announcing the strike: "Several bombs were dropped. Terrorists have been neutralised and weapons caches destroyed." This early-

morning flight lasted just over four hours and required the Rafales to refuel several times from a German Air Force Airbus A400M Atlas.

The strike marked a significant milestone for the Rafale, as it was the first operational weapons launch of the latest F3-R standard variant. The F3-R is able to carry a Meteor beyond visual

range air-to-air missile, the TALIOS advanced targeting pod and new air-to-ground weapons such as the Raytheon GBU-16 Paveway. Opération Chammal began on September 19, 2014. In co-ordination with the Iraqi government and the allies of France present in the area, Chammal provides military support to local anti-IS forces.

Below: French Air Force Dassault Rafale F3R standard serial number 117 '30-IV' from Fighter Wing 30 taxiing at Prince Hassan Air Base, Jordan, from where this latest variant carried out its first air strikes on September 12 Armée de l'Air



September 22, 2020: a United States Air Force Boeing KC-135 Stratotanker refuels a US Navy Boeing F/A-18E Super Hornet over the US Central Command's area of responsibility, which stretches from Northeast Africa across the Middle East to Central and South Asia US Air Force/Staff Sgt Jason Allred



Above: Royal Danish Air Force (RDAF) F-16AM serial number E-005 was one of the aircraft taking part in flypasts to mark the RDAF's 70th anniversary on October 1. Of particular note was the new colour scheme, applied to the aircraft during a recent visit to Aalborg for scheduled maintenance, which was seen for the first time during the flypasts. As a trial, it has been specially painted in the same colour scheme that will be applied to the RDAF F-35A Lightning IIs, the first of which is due for handover next year. An impression of an F-35A in the new colours had first been released by the RDAF on June 8 Flyvevåbnet

Taking lethal combat skills to the MAX

A THREE-DAY chemical warfare exercise was conducted by the US Air Force's 48th Fighter Wing, September 29 to October 1, across RAF stations Lakenheath, Mildenhall and Coningsby.

The Maximum Assurance eXercise (MAX) 20-20 is designed to test skills necessary for conducting operations in both chemical warfare and conventional environments.

The activities integrate agile combat employment (ACE) elements that are designed to develop capabilities for conducting operations

from forward-operating bases with varying levels of capacity and support.

The differing support levels would be due to chemical attacks across the battlespace.

During MAX 20-20, a number of Boeing F-15E Strike Eagles from RAF Lakenheath operated from Coningsby, alongside RAF Eurofighter Typhoons.

"Agile combat employment enables airmen to utilise flexibility and ingenuity to defeat the enemy in austere conditions," said Col Jason Camilletti, commander of the 48th Fighter Wing.

€300m for Austria's AW169M fleet

IN A JOINT procurement deal with Italy, from 2022, Austria will spend €300m on 18 Leonardo AW169M helicopters, to replace its air force fleet of Aérospatiale Alouette III liaison/utility helicopters. The AW169M is the military version of the Leonardo AW169, a 4.5 tonne, twin-engine helicopter.

18 are being bought to ensure that sufficient numbers remain airworthy, while others are being maintained. Each one costs from €8m to €15m, depending on equipment and additional packages, which may include weapons. The first delivery is expected in mid-2022. On its Q&A web page

about the AW169M helicopters acquisition, the Austrian Ministry of Defence (MOD) explains that the AW169 was chosen because: "In Italy, the [MOD] has found a partner who is willing to co-operate with the Austrian Armed Forces in all areas of the operation of military helicopters."

It added that Italy has ordered 100 AW169s, which also meet the Austrian requirements.

Austria says initial training will be with the Italians, but, in future, the military will train its own pilots.

The €300m includes the procurement and logistics, training and infrastructure requirements. Some of

the helicopters' equipment may be supplied by Austrian firms.

Ordnance that can be carried by the AW169M includes a 12.7mm cannon, unguided or guided rockets, laser-guided missiles and a forward-looking infra-red sensor for targeting and aerial reconnaissance tasks.

Army to get first Victor Black Hawk

THE FIRST Sikorsky UH-60V Black Hawk with its upgraded cockpit avionics was released from Corpus Christi Army Depot on October 1 for delivery to the United States Army.

The UH-60V – Victor – version is a UH-60L 'Lima' model upgraded with a digital glass cockpit produced by Northrop Grumman. The first UH-60L to become a UH-60V arrived at Corpus Christi Army Depot, Texas, where the upgrade work is done, on January 9, 2019. The US Army is upgrading all its UH-60Ls with this digital cockpit. The army does have more recent 'Mike' models, UH-60M, which also have these

digital avionics, but the glass-screen interface is not identical to this latest Victor version.

Corpus Christi Army Depot commander Col Joseph Parker said: "This is the first of up to 760 [Victor models] Black Hawks that will modernise the helicopter fleet through the army's recapitalisation programme."

The first fully-configured UH-60V made its maiden flight at the depot on September 12. The army is retiring its older UH-60A models. Eventually, the Black Hawk fleet will comprise around 1,375 UH-60Ms and 760 UH-60Vs.



Above: Luxembourg Armed Forces Airbus A400M CT-01 on the ramp outside the final assembly line at Seville-San Pablo Airport, Spain, on October 1. The Belgian Air Force, which will operate and maintain the aircraft on behalf of Luxembourg as part of the Belgian-Luxembourg Binational Air Transport Unit at Brussels-Melsbroek, said on the same date that delivery of the aircraft was expected within a few days Belgian Air Force

Wildcats with snipers stop drug-runners

A ROYAL Marine 42 Commando sniper team flew on board a Royal Navy 815 Naval Air Squadron AgustaWestland AW159 Wildcat helicopter in September to combat suspected drug-runners in the Caribbean.

Royal Marines from 47 Commando, members of the United States Coast Guard and personnel from the Dutch Navy ship HNLMS *Groningen* boarded suspect vessels to conduct searches.

During this and another operation two days later, 1.7 tonnes of cocaine and 28kg of amphetamines were seized.

The Wildcat launched from Royal Auxiliary Fleet (RFA) ship *Argus*, which also has AW101 Merlin helicopters onboard, and these too were involved in an interception.

James Heapey, UK Minister for the Armed Forces said: "The Armed Forces are committed to tackling organised crime, both at home and overseas, and work with our allies around the world to help protect our people and interests."

"The Royal Navy has once again demonstrated its professionalism and tactical operational capability in an

international effort to stop illegal drug-smuggling. It is with thanks to their efforts that £160m worth of drugs will never reach the streets of the United Kingdom."

The UK works in partnership with allied nations in the area as part of Joint Interagency Task Force South. It detects and monitors activity to support security operations from its Florida base. RFA *Argus* is in the Caribbean as part of an RN task group with HMS *Medway* providing support to British Overseas Territories during hurricane season.



Above: The first fully-configured UH-60V makes its maiden flight from Corpus Christi Army Depot, Texas, on September 12, after completing conversion at the facility. It was formally released for delivery to the US Army on October 1 US Army/CCAD

USMC F-35s deploy on *Queen Elizabeth*

TWO LOCKHEED Martin F-35B Lightning II fighter squadrons – the Royal Air Force's 617 and the United States Marines Corps' VMFA-211 – have deployed with the Royal Navy aircraft carrier *HMS Queen Elizabeth*.

VMFA-211, known as 'The Wake Island Avengers', is based at Marine Corps Air Station (MCAS) Yuma in Arizona, but arrived in the UK in September. Its F-35s flew to RAF Marham in Norfolk, the home of

the UK Lightning Force, where 617 squadron, 'The Dambusters', is based. The squadrons worked together for Exercise Point Blank, before deploying to *HMS Queen Elizabeth*.

With 14 jets and eight

Merlin helicopters, *HMS Queen Elizabeth* carries the largest concentration of fighters to operate at sea from a Royal Navy carrier since *HMS Hermes* in 1983.

"*HMS Queen Elizabeth* will be operating with the largest air group of fifth-generation fighters assembled anywhere in the world," said Cdre Steve Moorhouse, the Commander of the United Kingdom Carrier

Strike Group.

"Led by the Royal Navy, and backed by our closest allies, this new Carrier Strike Group puts real muscle back into NATO and sends a clear signal that the United Kingdom takes its global role seriously."

HMS Queen Elizabeth will be joined by seven Royal Navy destroyers, frigates and auxiliaries, plus other supporting units, to form the carrier strike group. The group will participate in NATO's largest annual exercise, Joint Warrior, which is taking place

off the northeast coast of Scotland.

Lt Col Joseph Freshour, the commanding officer of VMFA-211, said: "We are looking forward to deploying alongside our British counterparts over the next few months, and we will work tirelessly as a part of this transatlantic naval force. We are proud to play such an important role in the generation of an ally's carrier strike capability."

Lockheed Martin F-35B Lightning II fighters from United States Marines Corps squadron VMFA-211 'The Wake Island Avengers' arriving on the Royal Navy aircraft carrier *HMS Queen Elizabeth*
UK Ministry of Defence



Life's a beach for Atlas

MEMBERS OF 206 Sqn have been practising sand landings and take-offs in an Airbus A400M Atlas transporter on a beach in south Wales.

The RAF's Heavy Aircraft Test and Evaluation 206 Sqn spent September 18 putting the aircraft through natural surface operations (NSO) testing and evaluation on Pembrey Sands.

The RAF said the day's tests passed without incident. Since 2018, 206 Sqn has undertaken the Atlas's NSO-capability trials, but those responsibilities have now been officially handed over to the Air Mobility Operational Conversion

Unit, XXIV Sqn.

Wg Cdr Neil Philp, Officer Commanding 206 Sqn, said: "This milestone demonstrates the fantastic tactical airlift capability

of the A400M, and has the potential to make an immediate impact to operations. The handover of the capability to XXIV Sqn is the culmination of

several years of test and evaluation, and has been a true team effort to deliver."

The A400M began RAF service in 2014, as a tactical airlift and strategic

oversize lifter. This makes it an effective partner in operations with the Lockheed Martin C-130J Hercules and Boeing C-17 Globemaster.



A Royal Air Force Airbus A400M Atlas transporter practises take-offs and landings on Pembrey Sands beach in south Wales, UK, as part of its natural surface operations testing and evaluation on September 18 UK Ministry of Defence

RAF's 'red team' Typhoons go grey

THE FIRST Royal Air Force Eurofighter Typhoon painted in a new 'aggressor' colour scheme arrived at Kinloss Barracks on September 18.

It is attached to No. IX (Bomber) Sqn, based at RAF Lossiemouth, which will be the RAF's dedicated aggressor squadron. Its Typhoons will simulate the tactics, threats, and procedures of RAF adversaries to help train pilots. The squadron will also be involved in

quick reaction alert duties.

The first Typhoon with the new 'shark grey' colour scheme, serial number ZJ914, arrived at Kinloss from RAF Coningsby on September 18.

A hangar and other facilities are still being developed at RAF Lossiemouth, with work expected to be completed in two years. It will involve the refurbishment of a hangar and construction of technical and storage facilities.



The 'aggressor' Royal Air Force Eurofighter Typhoon ZJ914 arriving at Kinloss Barracks on September 18 Niall Paterson



The Royal Air Force's fifth Boeing P-9A Poseidon MRA1 on the runway at Boeing Field, near Seattle, after its maiden flight from Renton, Washington, on September 19. The aircraft - serial number ZP805 (construction number 65754) and carrying civilian test registration N534DS and callsign 'Boeing 175' - is named 'Fulmar' in honour of its future base at RAF Lossiemouth, which was known as HMS Fulmar when it was a Royal Navy airfield. It will be delivered once its mission systems have been installed Joe G Walker



Dragons' den: A United States Army King Air 300LW, serial number 07-61011, callsign 'DRAGN11', arrived at Belfast International Airport, Northern Ireland, on September 18 from Prague, Czech Republic. The aircraft was heading home, along with a second example, 07-61012, 'DRAGN12', after being deployed Colin Gordon

In Brief

Lakenheath's USAF 495th first UK unit to get F-35A

OFFICIALS AT RAF Lakenheath, Suffolk, announced on September 15 that the 495th Fighter Sqn will be the first USAF unit in the UK to fly the Lockheed Martin F-35A Lightning II.

It was known that Lakenheath's 48th Fighter Wing was to receive its first F35A in late 2021, but until now the squadron had not been named. The unit previously flew the F-111F at Lakenheath, but was de-activated on December 13, 1991.

UK firm wins USMC Herc tanker contract

MARSHALL AEROSPACE and Defence Group (MADG) has won a ten-year, multi-million-dollar maintenance contract for the US Marine Corps' (USMC) Lockheed Martin KC-130J tankers.

The first of the USMC's 66 KC-130Js will arrive later this year in Cambridge, UK, where Marshall Aerospace is based. Five USMC Marine

aerial refueller transport squadrons are equipped with the KC-130J.

MADG will perform scheduled and unscheduled maintenance, repair and overhaul (MRO) services for Naval Air Systems Command's (NAVAIR) Tactical Airlift Program Office (PMA-207).

Gary Moynahan, the chief

executive of MADG, said: "This represents a very significant step forward in our strategy to grow our share of business in North America."

He added that MADG's securing of the contract builds on more than 50 years of service to the Royal Air Force Hercules fleet, which continues to be the bedrock of MADG's military

aerospace business.

MADG supports the C-130 platform for 17 UK Government operators, including the UK Royal Air Force under the Hercules Integrated Operational Support (HIOS) contract.

MADG already works closely with the US Government and the US Department of the Navy through NAVAIR. The company initially won a

support contract in 2019 for three Kuwaiti KC-130Js purchased through the US Government's Foreign Military Sales process, and, more recently, supported the entry into service of the iconic 'Fat Albert' replacement for the Blue Angels Flight Demonstration Squadron [see 'New Blue Angels Fat Albert C-130J Delivered', *AFM* September, p14].

Germany rethinks heavy helicopters

GERMANY announced on September 29 that it has cancelled its heavy transport helicopter project to replace its Air Force's Sikorsky CH-53G Sea Stallion fleet with up to 60 rotorcraft. The project was abandoned after the bidding process

showed that not all requirements could be met within the planned budget. The two competing types were the Boeing CH-47F Chinook and Sikorsky CH-53K King Stallion.

The decision to replace the ageing CH-53Gs was taken in 2017, although the

fleet will not reach the end of its useful life until 2030. In order to ensure there was no capability gap, a competitive tender was initiated quickly and the manufacturers were asked to submit offers in June 2019. A contract was to be agreed in 2021.

The project will now have to be re-examined to investigate what alternative options are possible to replace the German Air Force's ageing CH-53GA, CH-53GE and CH-53GS Sea Stallions.

The Federal Office for Equipment, Information

Technology and Use of the Federal Armed Forces, which has responsibility for the contract award, had made the assessment that the offers received were uneconomical. Despite this, the Ministry notes that the project still has a very high priority.

Bell delivers to Montenegro military

MONTENEGRO'S Minister of Defence, Predrag Bošković, accepted the first of two Bell 505 Jet Ranger Xs in the country on September 15, for the training of Montenegro Air Force pilots.

As part of the sale, Bell provided training for three pilots with HeliDeal, a facility certified for 505 pilot training located in southern France. The first aircraft's technical acceptance was in July at Bell Prague. The second

505 is expected to be delivered in January.

"Bell aircraft, which are unique in the Western Balkans, are the best choice for Montenegrin Armed Forces," said Bošković. "It will provide excellent training to our pilots, and opportunities to perform various tasks, but perhaps the most important is supporting civil institutions."

The Bell 505s were manufactured by Bell Textron Canada at

its facility in Mirabel, Quebec. The sale was facilitated by the Canadian Commercial Corporation, through a government-to-government contract. The Jet Ranger X has a speed of 232kph and payload capacity of 680kg. Montenegrin Maj Goran Senčić said: "We appreciate Bell being so flexible with the training process. Virtual training courses were easy to follow; effective in teaching us about the aircraft."



The first of two Bell 505 Jet Ranger X helicopters for training Montenegro Air Force pilots was accepted by the country's defence minister, Predrag Bošković, on September 15
Government of Montenegro

NATO tanker transport force grows

AIRBUS HAS received an order for an additional A330 multi-role tanker transport (MRTT) for the NATO multinational MRTT fleet (MMF), the company announced on September 28.

Operating primarily from Eindhoven, Netherlands, the MMF multinational tanker transport force will also have a forward operating base in Cologne, Germany. The MMF programme is funded by the Netherlands,

Luxembourg, Norway, Germany, Belgium and Czech Republic and will operate the aircraft in a pooling arrangement.

The European Defence Agency initiated the MMF programme in 2012 and eight A330 MRTT were ordered for the fleet in 2016. The order Airbus announced on September 28 is for one of three additional aircraft which were options in the original 2016 contract. It will increase the MMF fleet

to nine. The MMF A330 MRTT are configured for in-flight refuelling, cargo and passenger transport and medevac.

The additional order follows a decision by Luxembourg to maximise its participation, increasing its contracted flight hours from 200 to 1,200. The original 2016 MMF contract was placed on behalf of NATO's support and procurement agency by the European Organisation for Joint

Armament Co-operation; known by its French acronym OCCAR.

This additional optioned MRTT aircraft order follows the delivery in June and August of two of the original OCCAR contract's eight aircraft.

France is also ordering more MRTT aircraft: on September 24, Minister of the Armed Forces Florence Parly welcomed the August 25, 2020, order of three Airbus A330s by the government's

General Directorate of Armaments. The three aircraft will be converted to France's Phénix MRTT configuration.

The contract is worth €200m – the first two examples will be delivered at the end of 2020 and the third in 2022. They will bring the French Air Force's MRTT fleet to 15 aircraft. The three A330 Phénix MRTTs will allow the air force to retire two Airbus A340s and two Airbus A310s.

Upgraded Su-25s returned to Bezmer

TWO OVERHAULED Bulgarian Air Force Sukhoi Su-25 close air support aircraft were redelivered to Bezmer Air Base from Belarus in an Ilyushin Il-76TD over September 21-22.

The aircraft, two-seat Su-25UBK serial 002 and single-seat Su-25K

serial 246, were flown in on Ilyushin Il-76TD registration EW-412TH, operated by Ruby Star Airways. They had been due to return in July, but delivery had been delayed by the COVID-19 pandemic. They are the first of eight to be upgraded under a

framework agreement signed on December 14, 2018, with Air Repair Plant 558 at Baranovichi in Belarus. The first aircraft had left Bezmer on board an Il-76 on August 28, 2019, with the final example making the journey to Belarus on October 7.

The deal was originally

planned to be for 14 aircraft, but was reduced to eight, comprising six single-seat Sukhoi Design Bureau Su-25K and two twin-seat Sukhoi Design Bureau Su-25UBK aircraft. Once all eight have been completed, which is expected by the end of February 2021, Bulgaria

will consider whether to have the remaining six upgraded. In addition to a service life extension programme, an upgrade has enabled the aircraft to carry a wider range of advanced weapons, with longer range and increased accuracy, according to the Bulgarian Air Force.

Swiss clock up fighter support

BY A MAJORITY of just 9,000 votes, citizens of Switzerland narrowly favoured the procurement of new multi-role fighters for the Swiss Air Force in a national referendum held on September 27.

The referendum had a relatively high overall turnout of 59.4%, with 50.1% of voters favouring the CHF6bn (\$6.49bn)

acquisition. According to the Swiss Broadcasting Corporation's international unit, Swissinfo, 'projections over the past weeks had shown clear acceptance for the government-backed plan', but the actual result was hard to call until the very last minute.

This result comes after the Swiss population rejected a funding

package to acquire Saab's Gripen E multi-role fighter in 2014. Once again, voters had the chance to approve or reject the Swiss Department of Defence's Air2030 fighter procurement programme and the acquisition of a new extended-range ground-based defence system. The Air2030 project seeks to procure

a new multi-role fighter to replace the air force's ageing Boeing F/A-18C/D Hornet and Northrop F-5E/F Tiger II fleets.

The Swiss Air Force's F-5E/F fleet is the older of the two platforms, having served since 1978. In total, 110 were delivered to Switzerland, comprising 98 single-seat F-5Es and 12 two-seat F-5Fs.

AirForces Intelligence (AFI) database states that the Swiss air arm operates a total of 23 F-5Es and six F-5Fs. Switzerland's legacy Hornet fleet entered operational service in 1997. The air force accepted 26 F/A-18Cs and eight F/A-18Ds. AFI data adds that 25 F/A-18Cs and five F/A-18Ds are in service.



A Boeing AH-64 Apache attack helicopter fires rockets during Exercise Wojtek Fire in Bemowo Piskie, Poland, September 16, 2020. The live-fire exercise involved forces from the UK, Croatia and the US testing tactical interoperability and air-to-ground integration training among NATO allies comprising Battle Group Poland. British Army Capt Sam Davies

Lightning strikes thrice for Norway

THREE MORE Royal Norwegian Air Force (RNoAF) Lockheed Martin F-35A Lightning IIs arrived in Norway on September 27, bringing the total delivered to 28.

They landed at Norway's Ørland Air Base at 1840hrs local time. Their ferry flight from Fort Worth, Texas, started at 0630hrs US time the previous day. Of the

28 F-35As now in RNoAF service, 21 are operating with the country's 332 Squadron. The other seven are located at Luke Air Force Base, Arizona for training purposes. Norway intends to procure a total of 52 F-35As.

The Lightning IIs will take over Norway's domestic quick reaction alert mission from 2022, when

the nation's Lockheed Martin F-16AM/BM (MLU) Fighting Falcons start being retired.

"We are already focusing on training towards full operational capability in 2025," said Lt Col Tron Strand, the new CO of 332 Squadron.

The type achieved initial operational capability with the RNoAF on November

6, 2019. It completed its first deployment earlier this year in support of NATO's Icelandic air policing mission, and it is scheduled to conduct a similar deployment in 2021. The three delivered aircraft have serial numbers 5387, 5388 and 5389 and, respectively, the construction numbers AM-26, AM-27 and AM-28.



The USAF Boeing B-52H Stratofortress, serial number 61-0034, tail code 'MT', from the 5th Bomb Wing/23rd Bomb Squadron 'Bomber Barons' flies over Poland on September 23 in formation with three Polish Air Force fighters. They are the Lockheed Martin F-16C Fighting Falcon, serial number 4052; the Mikoyan Gurevich MiG-29M, serial number 89; and the Mikoyan Gurevich MiG-29UBM with the serial number 15. The B-52H, based at Minot Air Force Base, North Dakota, was on detachment to the UK at RAF Fairford, Gloucestershire, from where it conducted extensive missions all over Europe. Polish General Command

Greek Rafale bid

THE GREEK government has announced its intention to procure 18 Dassault Rafales as part of its plans to strengthen the country's military.

Prime Minister, Kyriakos Mitsotakis made the announcement on September 12 at the Thessaloniki International Fair (TIF) and this was followed by a statement from Dassault the same day. Alongside the Rafales for the Hellenic Air Force (HAF), the nation will procure four new frigates and recruit 15,000 military personnel. Greece has a long history with Dassault, which started when the country ordered 40 Mirage F1s in 1974, followed by 40 Mirage 2000s in 1985 and 15 Mirage 2000-5s in 2000.

Éric Trappier, chairman and CEO of Dassault Aviation in France, said: "[The company] is fully mobilised to meet the operational needs expressed [by the HAF], and thus contribute to ensuring Greece's sovereignty and the continued safety of the Greek people."

Greece's Rafale plans follow its intention to acquire 24 Lockheed Martin F-35A Lightning IIs, announced in January 2019. However, no contract has been signed.

Falcon Leap vaults all its hurdles



A colourful Short SC-7 Skyvan was rented by the Czech Air Force to be used during Falcon Leap Maikel de Vaan



West Virginia Air Guard Lockheed C-130H Hercules landing at Eindhoven Air Base, Netherlands, during the annual exercise, Falcon Leap Maikel de Vaan

DESPITE THE COVID-19 crisis, the Falcon Leap airborne exercise, organised by the Royal Netherlands Army 11th Airmobile Brigade and Royal Netherlands Air Force (RNLAf) 336 Sqn took place in September.

The annual exercise is flown from Eindhoven Air Base, home to the RNLAf air transport fleet. This year it ran from September 7 to 18, and was an opportunity to practise dropping cargo loads by parachute in week one, with training for paratroopers in week two.

It proved to be a truly international event.

The Belgian Air Force participated with a C-130H; Germany sent a Transall C-160 and two civilian-registered M28 Skytrucks; while France offered a new KC-130J. The Czech Air Force hired two SC.7 Skyvans from Pink Skyvan to drop paratroopers, while the US sent a C-130H from the West Virginia Air National Guard. Later, a US C130J-30 of the 86th Airlift Wing from Ramstein Air Base also took part.

Every day, there were three waves of flights, each featuring three or four aircraft. The civilian Skytruck and Skyvan

did not fly with these formations, and only participated in separate paratroop free-fall missions in the second week. Paratroopers jumping from the Hercules and Transall used static-line parachutes. One of the highlights took place when the American Ambassador to the Netherlands, Peter Hoekstra, made a free-fall tandem jump with a team from one of the Skyvans.

In this year's exercise, the RNLAf used the Low Cost Aerial Delivery System (LCADS) to drop cargo. LCADS is a single-use, airdrop system consisting of a modular suite of low-

cost equipment, including parachutes, containers, platforms and other air systems, configured for low-velocity (LV), high-velocity (HV) and free-drop use.

LCADS reduces the high cost of material and fabrication through simplification, and this was its first deployment from a Dutch Hercules. The system used was apparently 'borrowed' from the USAF and it is not known whether the RNLAf will purchase the system themselves in future.

Due to coronavirus, extra precautions were taken throughout the exercise. For example, the temperature of all participants was monitored daily, they had to disinfect their hands regularly, meals were eaten in separate groups, and, where possible, face masks were worn and social distancing measures were maintained.

The parachutists numbered 600 this year, normally around 1,000

will participate. In total, 2,500 parachute jumps were made and 23,000kg of goods delivered in dropzones at Ginkelse Heide, Leusder Heide and Deelen Air Base.

Normally, a major aerial commemoration of Operation Market Garden would be held on the Saturday, after the exercise. In the past, this has involved hundreds of paratroopers being dropped onto Ginkelse Heide, attracting large crowds of spectators, but this year it had to be cancelled owing to COVID-19. However, on the evening of September 18, a small flypast took place over Eindhoven, to commemorate the liberation of the city 76 years ago.

It comprised Hercules from 336 Sqn (RNLAf) and 20 Sqn (BAF); a LTG63 (GAF) Transall; and an A400M of ET01.061 (FAF); along with a B-25 Mitchell and a Spitfire Mk IX from the RNLAf Historic Flight Foundation.



German Air Force PZL Mielec M28 Skytruck leaving Eindhoven Air Base for an air drop Maikel de Vaan



Paratroopers board a Dutch Lockheed C-130H Hercules and a German Air Force Transall C-160 Maikel de Vaan

Spectre arrives for Irish Air Corps

THREE PILATUS PC-12 NG Spectre aircraft purchased for the Irish Air Corps (IAC) for more than €43m flew into Casement Aerodrome in Baldonnel, Ireland, on September 10, to replace five Cessna FR172H Skyhawks.

The aircraft have been allocated IAC serials 281, 282 and 283, but they arrived wearing the temporary US civil registrations N280NG (c/n 1795), N281NG (c/n 1838) and N282NG (c/n 1844).

The PC-12NG can be used for intelligence,

surveillance, target acquisition and reconnaissance, troop and equipment transport and medical evacuation. The three aircraft underwent a series of tests and inspections following their arrival. Additional flight and equipment testing occurred later in September and continued into October. Testing needs to be completed before the aircraft are to be fully accepted and deemed ready for operations. The five Cessna FR172H Skyhawks

being replaced were purchased in 1972.

Ireland's Minister for Defence and Foreign Affairs, Simon Coveney, visited the aircraft at Casement Aerodrome on September 16. He said: "These aircraft will provide a versatile capability to the Air Corps and will be capable of operating in various roles on a 24/7 basis in all types of weather conditions."

The contract for the aircraft was awarded to Pilatus in December 2017 following an open tender.

Canada starts fifth detachment to Romania

SIX ROYAL Canadian Air Force (RCAF) Boeing CF-18 Hornet fighters began their enhanced air policing mission, under Operation Reassurance, on September 5, to secure Romanian skies until December 2020.

Canadian fighter pilots, mostly from 433 Tactical Fighter Squadron (433 TFS), will hold a quick reaction alert posture to augment Romanian air-policing capabilities. The RCAF detachment will consist of about 135 personnel and six CF-18 Hornets. The pilots will also fly training missions with the Romanian Air Force, and other regional allies and partners. The missions will include patrolling Romanian air space and intercepting aircraft. This deployment marks the fifth time Canada has sent a detachment to Romania in support of NATO's enhanced air policing.

"Air policing is a critical part of NATO's mandate and is a mission our crews excel at, thanks to their training and experience with our own 24/7/365 NORAD [North American Aerospace Defense Command] mandate," said Maj Gen Eric Kenny, Commander 1 Canadian Air Division and Joint Forces Air Component Commander. "I know they will take every opportunity to share their knowledge and learn from our Romanian and regional allies, as they help secure the Romanian skies."

The Canadian air task force will work with the Romanian Air Force under NATO command. The Canadian armed forces Air Task Force – Romania received their readiness certification from NATO during a certification ceremony on September 5 at Mihail Kogălniceanu Air Base.



Left: UK-based US Air Force Bell Boeing CV-22B Osprey, serial number 12-0065, assigned to the 352nd Special Operations Wing's 7th Special Operations Squadron 'Air Commandos' at RAF Mildenhall, Suffolk, takes off from Rygge Air Base, Norway, on August 25. The Wing had deployed CV-22Bs and Lockheed Martin MC-130J Commando IIs to Norway to participate in Exercise Fluid Needle, jointly with the Royal Norwegian Air Force, between August 24 and 28. USAF/Staff Sgt Michael Washburn

In Brief

■ Formation of French Air and Space Force

As of September 11, the French Air Force has been officially renamed as the French Air and Space Force. The move followed the announcement by French President, Emmanuel Macron, on July 13 last year that a new space command would be formed within the air force, after which it was officially created on September 3, 2019. The name change marked the final stage in the integration of the new unit into the air force.

■ French Special Air Forces Brigade formed

As part of a reorganisation of French special forces, the French Air and Space Force established a Special Air Forces Brigade (BFSA) on September 1. Two aviation units will come under BFSA control, comprising Transport Squadron 3/61 'Poitou' at Orléans-Bricy with Lockheed C-130H Hercules and de Havilland Canada DHC-6 Twin Otter 300s; plus Helicopter Squadron 1/67 'Pyrenees' at Cazaux with Aerospatiale SA330Ba

Pumas and Eurocopter EC725 Caracals. Both units previously supported French special operations missions and will continue in this role.

■ French Navy retires Westland Lynx

After more than 40 years of service, the Westland Lynx was finally retired from French Navy service on September 4. On that date, a ceremony was held at Lanvéoc-Poulmic naval base, to mark the withdrawal of the type and the temporary disbandment of the final unit, Naval

Air Squadron 34F. The type is being replaced by the NHIndustries NH90 Caiman Marine. To overcome a capability gap, 12 Airbus Helicopters' Dauphins and four H160s will be leased to form an interim fleet. To operate the Dauphins, 34F will be reactivated in 2021. In 2022, 32F will also reactivate to fly the four interim H160s.

■ Czech order for UH-1Ys and AH-1Zs

Bell Textron was awarded a \$272.16m foreign military sales contract by US Naval Air Systems

Command on September 4, for the production and delivery of eight Bell UH-1Y Venoms and four AH-1Z Vipers to the Czech Republic. Contract completion is expected in November 2023. Prior to the production order, a government-to-government contract for these helicopters had been signed at the Pentagon in Virginia on December 12 last year, between US Defense Secretary Dr Mark Esper and Czech Defence Minister Lubomir Metnar (see 'In Brief', February, p13).

Kingfishers start Canadian migration

THE FIRST of 16 Royal Canadian Air Force (RCAF) Airbus Defence CC-295 Kingfisher search and rescue aircraft arrived at Canadian Forces Base (CFB) Comox in British Columbia on September 17.

This first operational aircraft was accepted by Canada at the factory in Spain on December 18, 2019, and delivered to Comox after additional testing and evaluations. It will be flown by the 19 Wing's 418 Search and Rescue Operational Training Squadron, while the RCAF completes aircrew training and operational testing. During the transition period, while the CC-295 is being introduced into service, fixed-wing search and rescue (FWSAR) services

will use the RCAF's AgustaWestland CH-149 Cormorant and Bell CH-146 Griffon helicopters.

Dirk Hoke, CEO of Airbus Defence and Space, said: "Despite the current pandemic, we are confident of achieving the [programme] target of six deliveries by the end of this year."

Canada announced selection of the Airbus C295W for its FWSAR programme on December 8, 2016, having already placed an order for 16 aircraft on December 1. The Kingfisher will replace the ageing de Havilland Canada CC-115 Buffalo and SAR-configured Lockheed CC-130H Hercules fleets, which entered service in the SAR role in 1968 and 1974, respectively.

Although Airbus has formally handed over three examples to the RCAF, the September 17 arrival is the first of these to reach Canadian soil. The other two remain in Spain. The second was expected to arrive in October, with four more planned to follow by the end of the year. Deliveries of the remaining nine are due to be completed by 2022.

Aside from Comox, just north of Vancouver Island, the Kingfishers will be based in Trenton, Greenwood and Winnipeg. The aircraft will be arriving in phases as crews are trained at each location.

A separate training contract also includes three additional airframes that will only be used as aircraft maintenance

trainers. The first of these was flown to Canada at the end of January 2020 and delivered to the SAR Training Centre at Comox (see 'CC-295 FWSAR trainer delivered to Canada', March, p16). After arrival, it was disassembled, moved into the new Training Centre and then reassembled.

Specifically designed to perform search and rescue missions across Canada, the aircraft is equipped with integrated sensors that will allow crews to locate persons or objects from more than 40km away, even in low-light conditions. Its communications systems will increase interoperability with other SAR assets, such as the CH-149.

Tinker checks a box for KC-46A build

A \$110 million two-bay maintenance hangar at Tinker Air Force Base (AFB), Oklahoma, being built for the Boeing KC-46A Pegasus is due to be ready in October when the type arrives.

Tinker, a designated maintenance hub for the new tankers, has undergone a \$500 million construction programme since 2016. It is only one of many bases that are seeing Pegasus-related construction totalling billions of dollars. McConnell AFB, Kansas, saw 16 projects in 2017 worth \$230 million and Altus AFB, Oklahoma, has eight projects at a cost of \$66 million. Numerous construction projects related to the KC-46A are ongoing at Joint Base McGuire-Dix-Lakehurst, New Jersey, Tinker AFB and Travis AFB, California.

"With additional infrastructure being built, the 156-acre maintenance campus will improve the operations and assure continuity of Tinker's mission in support of the KC-46 air refuelling operations worldwide," United States Air Force Civil Engineer Center (AFCEC) project manager, Rafael Gonzalez said. "These developments were the first portion of a large construction effort expected to run through 2029."

Jointly, with the US Army Corps of Engineers and Naval Facilities Engineering Command, AFCEC's facility engineering directorate is managing construction efforts air force-wide to deliver infrastructure for the new tanker.

NP2000 KC-130T refuels Osprey

ON AUGUST 24, a US Navy Lockheed KC-130T tanker equipped with new NP2000 propellers refuelled a Bell Boeing MV-22B Osprey for the first time, US Naval Air Systems Command announced on September 22.

This KC-130T, Bureau Number 164441, tail code

'NY-441,' is undergoing further tests to qualify it to become the first NP2000-configured aircraft certified to conduct aerial refuelling missions.

Teams from the tactical airlift programme office PMA-207, the V-22 Joint Program Office and the Air Test and Evaluation

Squadron 20 co-ordinated the test event, which is required for airworthiness certification. Upon completion, 164441 will be transferred to Navy Fleet Logistics Support Squadron (VR) 62 to begin its new role.

The KC-130T's NP2000 propeller system is

designed for better reliability. It comprises eight composite blades, along with a digital electronic propeller control system.

"Our innovative NP2000 system incorporates more intelligent, state-of-the-art technologies designed to enhance efficiency and boost aircraft availability," said Jean-Francois Chanut, Collins Aerospace propeller systems general manager. "We look forward to continuing to work with the Air Force to help them maximize the performance and availability of their C-130 fleet."

Collins Aerospace has been tasked with delivering NP2000 propeller systems for 30 US Air National Guard and Air Force Reserve Lockheed Martin C-130H Hercules under a contract announced by the company on September 14.



Above: The first-ever aerial refuelling by an NP2000 propeller-configured Lockheed Martin KC-130T Hercules for an HX-21 Bell Boeing MV-22B Osprey, serial number 166494, took place on August 24. The KC-130T, serial number 164441, is operated by VX-20 Squadron and has been fitted with the NP2000 propellers to improve its performance and reliability. NAVAIR

Airbus delivers the final UH-72A

AFTER ALMOST 14 years of deliveries, the final Airbus Helicopters' UH-72A Lakota was received by the United States military on September 23. Next year will see the arrival of the UH-72B.

The first UH-72A was delivered to the US Army on December 11, 2006, and in its tradition of naming their helicopter fleets after native American tribes, the rotorcraft was dubbed Lakota. Airbus has produced 463 of the light utility helicopters for the US Army, United States Navy and National Guard. The 463rd UH-72A was handed over at the company's facility in Columbus, Mississippi, on September 23. During those 13 years and nine months, the UH-72A has supported medical evacuation, search and rescue, troop transport, training, disaster relief and surveillance missions,

and has amassed nearly 800,000 flight hours.

"Since we first began operations with the UH-72 Lakota, this helicopter has been the workhorse of the Army and National Guard," said Col Calvin Lane, the US Army Project Manager for Utility Helicopters. "Procuring the UH-72B Lakota provides tremendous value, with no research and development costs for the Army."

Airbus Helicopters has an order for 17 UH-72Bs. The type is based on the H145, a four-tonne class, twin-engine rotorcraft that incorporates various product improvements. Airbus says that the H145 can operate in high and hot operating conditions and its Fenestron-style tail rotor is 'more efficient', its engines 'more powerful', the flight controls 'enhanced' and its Helionix avionics suite can provide benefits for 'safety and

flight performance'.

Airbus states that there are more than nine configurations available for the Lakota, for a broad spectrum of military missions. The company also provides training, aftermarket support and technical assistance for the North American regional in-service fleet, which includes civilian H145s, from Grand Prairie, Texas. In 2008, two years after the first Lakota delivery, the US Navy ordered five for test

pilot training at Naval Air Station Patuxent River.

"The programme was in peak production by 2010, with five aircraft a month being delivered, meaning nearly 60 a year," Airbus Helicopters' senior production manager, Ben Sullivan, said. In 2010, the Army added to the order backlog with its security and support (S&S) battalion contract for 20 aircraft and the retrofit of 16 that were already in service. The retrofits added a surveillance

package for day and night operations. Today, the S&S Battalion boasts 107 Lakota in its fleet.

In 2013, the Army decided to replace its old training rotorcraft at Fort Rucker, Alabama, with the Lakota, as part of an aviation restructuring initiative. There are now 205 Lakotas based at Rucker.

In 2014, Airbus started exporting Lakotas. It delivered the first of six to the Royal Thai Army through the foreign military sales initiative.



Above: A concept image of the Airbus UH-72B Lakota, that will be delivered to the US Army in 2021. The type is based on the twin-engine H145 with a number of improvements Airbus Helicopters

Night time sorties test F-35 fighter wings

NIGHT FLIGHTS were among around 80 sorties per day that fighter wings at Hill Air Force Base, Utah, carried out mid-September to test combat capability.

The US Air Force's 388th Fighter Wing and Reserve 419th Fighter Wing at Hill train at

night to maintain their combat readiness and all-weather capabilities. The exercise, held during the week beginning September 12, involved combat scenarios created specifically to evaluate aircraft maintenance and operational agility.

One crew skill that was practised was hot pit refuelling – which is filling the aircraft's fuel tanks while the engine is running. Maintenance crews also worked at night in support of the sorties.

"Team Hill [AFB] is working together to

practise as we would play in a deployed environment," said 388th FW commander, Col Steven Behmer. "We are a whole team – active duty and reservists – and the work is done seamlessly."

The 388th and 419th are both stationed at

Hill. Personnel from the 419th FW participated as part of their yearly annual tour requirement. The reservists train one weekend a month and two weeks a year. The exercise tests their readiness when faced with more tasks than in a normal drill weekend.



A slow shutter speed captures United States Air Force airmen conducting a hot pit refuelling of a Lockheed Martin F-35A Lightning II during night operations on September 14, 2020, at Hill Air Force Base, Utah USAF/Tech Sgt Phil Cowen

Mirages to fox Raptor and Lightning pilots

THE AIRBORNE Tactical Advantage Company (ATAC) has won a \$92m adversary air contract for training Lockheed Martin's F-22 Raptor and F-35 Lightning II pilots from January next year at Eglin Air Force Base, Florida.

The award will provide for more than 1,100 sorties per year for up to four-and-a-half years, which will be provided by ATAC's fleet of Dassault Mirage F1 fighters.

ATAC has now been selected for three adversary air contracts: Eglin AFB, Holloman AFB in New Mexico and Luke AFB in Arizona (see 'ATAC wins \$240m adversary air contract', September, p14). ATAC's flight operations at Holloman AFB were scheduled to begin by October and at Luke AFB by the end of this year.

ATAC general manager, Scott Stacy, said the company "is excited



Above: This Boeing F-15SA, serial number 12-1003, is taxiing to the main Boeing ramp after it arrived at King County International Airport-Boeing Field on September 19. It has been seen twice this year at Boeing Field; the first time in February Joe G Walker

to have been selected to provide adversary training at Eglin, Luke and Holloman AFBs, and we stand ready to serve additional future operating locations and customers as their needs evolve".

In a related move, on October 2, Paramount Aerospace Systems USA announced support for the ATAC Mirage F1 fighter

fleet. Paramount will expand its maintenance, repair and overhaul services and training support for the Mirage fleet. This is directly related to ATAC's new adversary contracts. The aerospace company intends to scale up significantly in both staff and services to meet the new requirements of ATAC.



Above: United States Air Force Maj Joshua Gunderson, Lockheed Martin F-22 Raptor demonstration team pilot and commander, performs an aerial demonstration over the flightline at Naval Air Station Oceana, Virginia, September 18, 2020



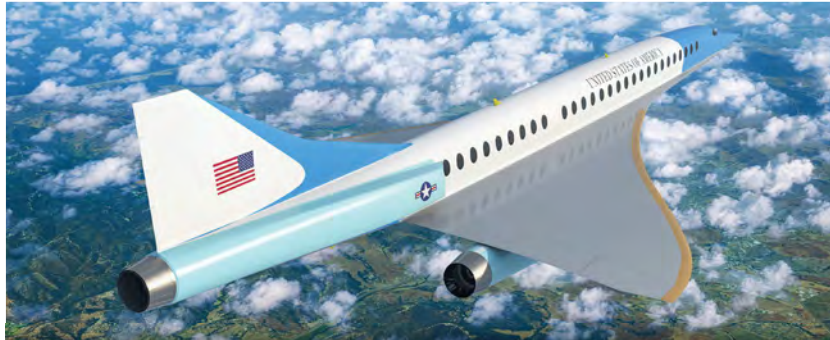
United States Air Force Lockheed Martin F-16C Fighting Falcon, serial number 88-0497, tail code 'HO', arrives at Eglin Air Force Base, Florida, on delivery to 40th Flight Test Squadron (FLTS). Flown by a test pilot from the unit, pilot Maj Nathan 'Doom' McCaskey, the aircraft was previously operated by the 8th Fighter Squadron (FS) at Holloman AFB, New Mexico. It still carries the unit's tail code. The 40th FLTS traded in one of its two-seat F-16Ds in a swap with the 8th FS for the single-seater USAF/Tech Sgt John Raven

Hypersonic Air Force One studied

The United States Air Force's presidential and executive airlift could one day travel faster than the speed of sound, if contracts that the USAF has awarded lead to viable supersonic or hypersonic aircraft.

Concepts for supersonic and hypersonic (five times faster than sound) executive transports, to carry the US President and other senior government officials, are currently in development by three USAF-funded companies: Boom Supersonic, Exosonic and Hermeus.

Atlanta-based Hermeus is developing its 'Mach 5 Aircraft', which, according to the company, would have the capability to travel from New York to London in just 90 minutes rather than the usual seven hours. The other two companies



A concept image of a proposed United States Air Force One executive transport capable of flying faster than the speed of sound, which is being developed by Boom Supersonic, one of three companies awarded contracts by the USAF to develop such concepts Boom Supersonic

are proposing supersonic flight, which refers to speeds above Mach 1.

The presidential and executive airlift directorate, part of the Air Force Life Cycle Management Center, is working with the three companies. In response to the contract awards given during this year, presidential and executive airlift program

executive officer Brig Gen Ryan Britton said: "The presidential and executive airlift directorate is extremely excited to team with Exosonic. Boom is an example of the American ingenuity that drives the economy forward through technological advances. [And we are] proud to support Hermeus in making this game-

changing capability."

Boom is developing a 55-seat, Mach 2.2-capable supersonic airliner called Overture, while Exosonic has a 70-passenger, Mach 1.8 cruise-speed concept. Hermeus successfully tested a Mach 5 engine prototype in February 2020. Any aircraft carrying the President of the United States has the callsign Air

Force One, but typically the President and Vice-President travel on two specially configured Boeing 747-200Bs that share the designation VC-25 and have the tail numbers 28000 and 29000, respectively.

It is likely to be some time before a supersonic or hypersonic Air Force One is actually being operated by the USAF. In February this year, the Air Force's VC-25B program began modifying the first of two Boeing 747-8 Intercontinentals, which will represent the USA around the globe. VC-25B, the next Air Force One, is engaged in designing, modifying, testing and delivering two aircraft to replace the VC-25A presidential transport, and act as a flying White House for the next 30 years.

Robot fighters for electronic warfare

ATTRITABLE REUSABLE unmanned aircraft systems (AR-UAS) should carry out electronic warfare and persistent intelligence, surveillance and reconnaissance, so they can fulfil their potential, the Virginia-based Mitchell Institute (MI) for Aerospace Studies has concluded.

In development by the US

military, AR-UAS, or Loyal Wingmen, are expected to be artificially intelligent, low-cost platforms. More expensive than a cruise missile, but cheaper than a piloted aircraft, the AR-UAS would not fly in close formation with a fighter. Instead, a pilot, in a traditional formation with a wingman

and other aircraft, would communicate with AR-UAS from a distance, with one pilot managing up to seven AR-UAS.

"The [AR-UAS] can help the air force increase its survivability and lethality. [They can be] used as decoys or to stimulate enemy defences, so they activate their sensors

and reveal their location," the institute's future concepts and capability assessments director, Mark Gunzinger, and co-author of the policy paper, said during the October 1 virtual rollout of the study. The paper was entitled *Understanding the Promise of Skyborg and Low-Cost Attritable*

Unmanned Aerial Vehicles.

The USAF's Skyborg programme aims to integrate UAS with open missions systems to enable pilot-UAS teaming.

The paper said the USAF should determine support and other requirements for launch and recovery of large numbers of AR-UAS from non-airfield locations.



Left: The United States Air Force Reserve 403rd Wing began evacuating its aircraft in preparation for Tropical Storm Sally on September 13 at Keesler Air Force Base, Mississippi. The 815th Airlift Squadron's Lockheed Martin C-130J Super Hercules and the 53rd Weather Reconnaissance Squadron's (WRS) Lockheed Martin WC-130Js relocated to Joint Base San Antonio and Ellington Airport, Texas. The 53rd WRS continued to fly data collection missions to support the National Hurricane Center from Ellington USAF/Staff Sgt Shelton Sherrill

Special Forces' Ospreys over Ukraine



A USAF Bell Boeing CV-22 Osprey assigned to the 352d Special Operations Wing, RAF Mildenhall, conducting fast rope insertion and extraction system training with Ukrainian and US Army Special Forces near Berdychiv, Ukraine, on September 20, 2020 as part of Exercise Fiction Urchin
USAF/Staff Sgt Mackenzie Mendez

TWO US Air Force Bell-Boeing CV-22B Ospreys and a USAF Lockheed Martin MC-130J Commando II deployed to Ukraine for Exercise Fiction Urchin with Ukrainian special forces, from September 16-24.

For Fiction Urchin, the two 352d Special Operations Wing Ospreys flew special forces soldiers out to Ukrainian boats in maritime operations, as well as conducting air-to-air refuelling with an MC-130J,

also from the 352d Special Operations Wing based at RAF Mildenhall in Suffolk. During the training exercise, Ukrainian forces integrated with the US Army and USAF for fast roping from the Ospreys and to practise infiltration, exfiltration and military freefall operations.

"During this training exercise, we're working side by side with our Ukrainian partners to develop our ability to execute special operations together," said

the US Air Force 352 SOW mission commander for exercise Fiction Urchin. "We practised mission planning, personnel airdrop, fast roping, infiltration and exfiltration techniques of the CV-22, and aerial refuelling."

The exercise was also to demonstrate the US commitment to the Black Sea region, offer support for the Ukraine SOF capability and increase recruitment efforts through various engagements with Ukraine SOF units.



The CV-22s also conducted exfiltration exercises to Ukrainian SOF boats and tilt rotor air-to-air refuelling with an MC-130J, to demonstrate their support for the Black Sea region
USAF/Staff Sgt Mackenzie Mendez

Kavkaz-2020 sees aerial bombardment

THE RUSSIAN Federation's Kavkaz-2020 exercise, from September 21-26, saw Russian Aerospace Forces conduct air operations at Russia's Kapustin Yar training ground as an international coalition against a mock enemy. Up to 1,000 military personnel from the Republic of Armenia, the Republic of Belarus, the People's Republic of China, the Union of Myanmar, and Pakistan all participated in the exercise, with Russian President Vladimir Putin present as an observer.

In the air operations, Sukhoi Su-27s cleared the

air space for other aircraft to engage targets. Two flights of Sukhoi Su-24Ms struck notional air defence sites with high-explosive fragmentation bombs, after which the Su-24MRs surveyed the area. Mock enemy armoured columns were attacked by Su-34 fighter-bombers, before command posts were destroyed by bombing from two detachments of Tupolev Tu-22M3 which dropped 1,500kg ordnance.

"The military personnel of the six states successfully coped with the tasks set, having worked out the use of a coalition group of troops

in the fight against armed formations of international terrorist organisations," said Russian Federation Deputy Minister of Defence, Lt Gen Yunus-Bek Evkurov.

Fleets of Mil Mi-28N Night Hunter attack helicopters, Kamov Ka-52 Alligator combat helicopters and Mil Mi-8 troop transports also participated in the multi-national event. The Ka-52s provided protection to the troop-carrying Mi-8 helicopters.

As well as the Kapustin Yar training ground, the Kavkaz-2020 exercise was held in the Black and Caspian Seas regions.



A Ukraine Air Force Sukhoi SU-27 integrates with a USAF Boeing B-52H Stratofortress assigned to the 5th Bomb Wing at Minot Air Force Base in North Dakota, during a Bomber Task Force Europe mission on September 4, 2020. Operations and engagements with US allies and partners demonstrate and strengthen the superpower's shared commitment to global security and stability
USAF/Senior Airman Xavier Navarro

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Israel buys AW119Kx for training

THE ISRAELI Ministry of Defense is purchasing five Leonardo AW119Kx training helicopters from Italy to replace its ageing Bell 206 Sayfans. Added to the seven procured last year, this brings the Israeli Air Force training fleet to 12 helicopters.

The overall package includes two simulators for

the Israeli Air Force flight school and represents a continuation of the 2011 deal signed by the Israeli and Italian governments.

Israel has purchased 30 M-346 training aircraft in exchange for an Italian procurement of an observation satellite and two airborne early warning systems.

"The completion of this agreement is essential for the training of IAF helicopter pilots and for the development of Israel's economy," said defence minister, Benny Gantz.

On September 22, Israel's defence ministry director general Amir Eshel, and his Italian counterpart, national armaments

director, Nicolò Falsaperna, signed a reciprocal procurement agreement. This completes a procurement arrangement between Israel and Italy that began in February 2019. The latest signing ceremony took place simultaneously in the defence headquarters of each country, one in Tel

Aviv, the other in Rome, and was screened via secure video conference.

The Israel Ministry of Defense has stated that in return, the Italian Ministry of Defense will purchase an unspecified number of Rafael Spike launchers and missiles plus Elbit Systems simulators for its Italian helicopters.

Belgian F-16s to Jordan

ON SEPTEMBER 29, four Belgian Air Component Lockheed Martin F-16AM (MLU) Fighting Falcons deployed to the Middle East in support of Operation Inherent Resolve – a coalition mission against Islamic State.

The four multi-role fighters departed from Florennes air base in

Belgium's Wallonia region to a base in Jordan, where they will be supported by about 100 personnel.

The 12-month deployment comes after the Belgian government decided on June 26, 2020, to send assets to the region to support the coalition operation. Personnel were placed in coronavirus

quarantine prior to the deployment and arrived in the region ahead of the F-16s.

The Belgian Armed Forces said: "This new deployment is necessary to avoid a resurgence of the [so called Islamic State]. The aircraft, pilots and support personnel will operate from a base in the

Middle East, from where they can intervene in support of coalition forces on the ground."

Belgium's commitment to Inherent Resolve falls within the framework of Resolution 2249 of the UN Security Council of 2015, which refers to the threat to international peace and security posed by Daesh.



Belgian Defence F-16AM FA77 departs from Florennes for Jordan on September 29
Belgian Air Force

Delivering the Marines



A United States Marine Corps (USMC) Lockheed Martin KC-130J Hercules, serial number 169230 and tail code 'QB-230', from Marine Aerial Refueler Transport Squadron 352, and assigned to the Special Purpose Marine Air-Ground Task Force-Crisis Response-Central Command, lands to deliver US Marines during the bilateral engagement Exercise Falcon Sentry in the United Arab Emirates (UAE), on September 24, 2020. Falcon Sentry is a combined engagement opportunity between the UAE Armed Forces and USMC to advance their collective defence capability within the region USMC/Sgt Brendan Custer

GlobalEye UAE delivery

SAAB DELIVERED another GlobalEye early-warning aircraft to the United Arab Emirates (UAE) on September 30, the second of three ordered in 2015 and five months from first delivery.

Saab's GlobalEye airborne early warning and control platform integrates the company's Erieye Extended Range active electronically scanned array radar and other sensors on board a Bombardier Global 6000 business jet.

The UAE is the launch customer of Saab's latest early warning platform.

The first UAE example was delivered on April 29. At the Dubai Airshow in November 2019, the nation announced its intention to acquire a fourth and fifth GlobalEye for an estimated cost of \$1.08bn, but no official order has been placed.

The Swedish-based manufacturer has included GlobalEye with the Saab JAS 39 Gripen E/F as part of its offer for Finland's fighter programme.

That programme intends to find a replacement for Finland's Boeing F/A-18 Hornet fleet and the government's requirements include electronic warfare.

First Gripen E Brazil flight

THE BRAZILIAN Air Force's first Saab Gripen E multi-role fighter completed its maiden flight in Brazil on September 24 – just four days after arriving in-country, having been shipped from Norrköping in Sweden.

The fighter flew from Navegantes International Airport in Santa Catarina to the Gripen Flight

Test Center (GFTC) at Embraer's facility in Gavião Peixoto, São Paulo.

Gripen E will conduct a range of missions, including air policing, attack and reconnaissance. *AirForces Intelligence* data states the first 11 serial production Gripen Es will be delivered to the Brazilian Air Force in a year's time. This initial

Gripen has been in flight test since it first flew in August 2019 and will undergo further testing at the GFTC.

Micael Johansson, president and CEO of Saab, said: "Gripen's arrival in Brazil and its first flight are major milestones in the Brazilian Gripen programme. We are proud

of this journey alongside so many qualified and committed professionals from both countries." The first Gripen will be officially presented to the country on October 23, during the national Aviator's Day and Brazilian Air Force Day ceremony in Brasília.

In 2014, Brazil awarded a \$5.4bn contract to Saab to build 28 single-seat

Gripen E and eight two-seat Gripen F multi-role fighters, completing a fleet of 36 aircraft. Of these, 13 examples will be produced at Saab's Linköping facility in Sweden and the remaining 23 will be built locally in Brazil.

Production of Brazil's first Gripen F began this year. Deliveries start in 2023 and conclude in 2024.



Brazil's first Saab JAS39 Gripen E, designated by the Brazilian Air Force as F-39 Gripen, concluded its first flight in Brazil on September 24. The aircraft flew from the airport in Navegantes, Brazil to Brazilian aircraft maker Embraer's facility in Gavião Peixoto Saab

Heron makes its nest in Brazil

THE ISRAELI-made IAI Heron I unmanned aircraft system (UAS) was inducted into the Brazilian Air Force (FAB) at Santa Cruz Air Base in August.

Designated the RQ-1150 in Brazil, the Heron multi-

role, medium-altitude, long-endurance (MALE) UAS, joined the First Squadron of the Seventh Aviation Group (1^o/7^o GAV) 'Orungan'. It is part of 12 Wing, based at Santa Cruz, and its entry into service

follows the FAB's first flight of the aircraft, which took place over Santa Cruz in November 2019. The Heron had the serial number FAB 7820. Work on incorporating a UAS into 12 Wing began in 2018.

The Heron's role will be Intelligence, Surveillance and Reconnaissance (ISR).

The Commander of the 1^o/7^o GAV, Lt Col Marcelo de Carvalho Trope, said that sharing experiences between units was a great opportunity to develop ISR activities. "It also enables an improvement in the results of the missions and in the intelligence products provided by the air unit."

Previously, 1^o/7^o GAV performed ISR missions using the Lockheed P-3AM Orion.



Above: One of the Brazilian Air force's Israel Aerospace Industries Heron I unmanned aircraft systems outside the historic Zeppelin hangar at Santa Cruz Air Base, Brazil Brazilian Air Force/Sgt Johnson Barros

Hercules strengthen Uruguay Air Force

URUGUAY AGREED a deal worth €21 million with Spain on September 9 to purchase two Lockheed Martin KC-130H Hercules.

They will modernise part of the Uruguayan Air Force and replace two 60-year-old FAU Lockheed Martin C-130Bs – only one of which remains fully operational. The former is stored, awaiting depot-level maintenance and the latter is flown by Air Transport Squadron No 3 at Montevideo-Carrasco. A third aircraft was abandoned at the base several years ago.

The C-130Hs are 20 years newer and a further €1 million will cover the acquisition of spare parts.

Prestwick Ecuadorian Grob visit

THREE GROB G120TP training aircraft passed through Glasgow Prestwick Airport, Scotland, on September 1, on their delivery flight to the Ecuadorian Air Force (FAE). The aircraft wore temporary German ferry

registrations D-EGAQ, D-EGAR and D-ETPU. Although they were painted in FAE training colours, they carried no nationality markings apart from a small Ecuadorian flag on the fin. Two of the three arrived at their

future home at Salinas-Ulpiano Paez Air Base on September 9. The third was delayed in the US – it is not known why, or when it will be delivered.

The FAE announced on December 27 last year that it had placed an order with

the German manufacturer for eight of these aircraft, and taken options on another eight.

They will join the Military Aviation Higher School at Salinas, operating alongside Diamond DA20C-1 trainers.

Mission for Morocco

Royal Moroccan Air Force Lockheed Martin F-16C/D Fighting Falcons integrate with a United States Air Force Boeing B-52H Stratofortress, which is assigned to the 5th Bomb Wing at Minot Air Force Base, North Dakota, during a Bomber Task Force Europe mission on September 7, 2020 USAF/Senior Airman Xavier Navarro



Super Tucano training plans for emergencies



An Airman, right, assigned to the 81st Fighter Squadron, explains Embraer A-29B Super Tucano egress procedures to Col Dan Walls, 23rd Wing Commander, on September 3, 2020 at Moody Air Force Base, Georgia. The 81st FS trains Nigerian, Afghan and Brazilian pilots and maintainers. Walls, a Fairchild Republic A-10C Thunderbolt II pilot, was learning about emergency routines for future A-29 flights USAF/Airman 1st Class Taryn Butler

Qatari H125 heads for Academy role



A Qatar Armed Forces Airbus Helicopters H125 QA-320, destined for the Al Zaeem Mohammed bin Abdullah Al Attiyah Air Academy at Al Udeid Army Camp, Doha, flying from Airbus Helicopters' facility at Johannesburg-Grand Central in South Africa on September 14. The helicopter is the first of 16 ordered for the Academy in March 2018 to replace the Gazelles currently in use. Although at least two, leased, second-hand helicopters entered service last year, this is the first confirmed sighting of one of the permanent additions to the fleet Vimages.com/Jono Druon

RAF Chinooks fly for France

ROYAL AIR Force Chinook C Flight from RAF Odiham-based 18 (Bomber) Squadron has been integrated into France's Groupement Tactique Désert-Aérocombat (GTD-A), which provides aviation support for Mali's counter-insurgency campaign.

The C Flight Chinooks, deployed as 1310 Flight RAF within GTD-A, have

transported French armoured vehicles at night, avoiding roads. The Chinook aircrew is also helping the French military to re-establish Malian Army forward operating bases to enable future French combat operations. The C Flight Chinooks are delivering supplies, equipment and heavy weaponry to the Malian

Army bases for the French troops. Once the bases have been re-established, they are to be handed over to the Malian Army.

Squadron Leader Jeff 'Fitzy' Fitzpatrick, the Officer Commanding 1310 Flight, said: "We can lift up to 34 fully-armed soldiers, allowing them to overcome the huge scale of Mali or, equally, several

tons of food, water and ammunition, providing the flexibility for remote troops to stay in the field longer."

RAF personnel and equipment are supporting the Chinook operations, conducting interoperability training with the French helicopters and the Danish Merlin Helicopter detachment, which is also integrated into GTD-A.

They have been refuelling helicopters in a procedure known as rotors turning refuels, which means the aircraft is refuelled without the engines being shut down and with the rotors still turning. This is a specialism of the UK military refuellers from the RAF and Army Air Corps, and one that requires additional training.



A UK Royal Air Force Boeing CH-47 Chinook from 18 Sqn RAF Odiham operating with Danish and French helicopters in Mali on Operation Newcombe United Kingdom Ministry of Defence

Australia's 30th F-35 arrives before IOC

THE ROYAL Australian Air Force (RAAF) accepted delivery of its 30th Lockheed Martin F-35A Lightning II in September, and the type is expected to achieve initial operating capability (IOC) this December.

RAAF Base Williamtown, New South Wales, is home to the F-35A's No 3 squadron and the No 2

Operational Conversion Unit. The RAAF is converting from a fleet of McDonnell Douglas F/A-18A/B Hornets to the Lightning II. Williamtown has an F-35 simulator for the base's Integrated Training Centre. In the 2016 Australian government defence white paper, it was stated that the RAAF would receive

72 F-35A aircraft by 2023 to meet the planned final operating capability deadline, three years after the expected IOC.

"It's rewarding to be part of the team establishing Australia's future air-combat capability. Working with local and international stakeholders, the team has also been integral to ferrying the majority of

these aircraft to Australia from the US," said F-35A air vehicle lead squadron leader Brook Porter.

Pre-acceptance testing of each example involves multiple checks on the production line at Lockheed Martin's facility in Texas and several flight tests from the same site. Porter said that an in-depth

acceptance process ensured that each F-35A was ready for Australian defence registration and operational use.

Porter is about to end a three-year posting in the Capability Acquisition and Sustainment Group with the Joint Strike Fighter Branch, where he has been involved in accepting 28 F-35A aircraft.

No luxury, no problem for the Spartan

THE ROYAL Australian Air Force's (RAAF) No 35 Squadron and No 383 Squadron practised operational integration with a Leonardo C-27J Spartan at austere airfields, flying from RAAF Base Townsville from September 10-18.

Exercise Ready Spartan Prove tested the Spartan's capabilities and both squadrons' abilities to integrate for a combined air operation. The training objectives were testing agile basing operations and C-27J operations in uncertain security environments. This included establishing deployed air-base infrastructure at the Benning and Macrossan Airfields, about 100km inland in regional North Queensland. The C-27J

is able to land on short remote runways, allowing access to regional areas in North Queensland where other aircraft may not be able to operate.

"This week we have seen self-protection countermeasures loaded into the C-27J by No 35 Squadron's maintenance teams and their subsequent use in the air," said Sqn Ldr Justin Della Bosca, B Flight Commander at No 35 Squadron and the exercise commander. "The crews are wearing body armour and carrying personal weapons while flying and performing realistic pre-mission tactics briefings."

Search, evade, resist and escape drills were also completed to test evasive action plans, enabling joint personnel recovery

training for combined air operations. Exercise Ready Spartan Prove was planned by No 35 Squadron

members with No 383 Squadron. They wanted to demonstrate that the aircraft, crew and support

teams are prepared to respond to the full spectrum of government-directed tasks.



Above: No 35 Squadron C-27J Spartan A34-008 deploying defensive countermeasure flares during a sortie over Benning Airfield as part of Exercise Ready Spartan Prove on September 10-18 RAAF

HMAS Arunta says g'day to Korean Lynx



Above: A Republic of Korea Westland Lynx conducting a helicopter cross deck exercise over the flight deck of Her Majesty's Australian Ship Arunta, as part of the Regional Presence Deployment 2020 in the Pacific Ocean in September 2020 LSIS Ernesto Sanchez

Philippines' Super Tucanos land

ALL SIX Embraer A-29B Super Tucano close air support aircraft ordered by the Philippine Air Force (PAF) were delivered to the Philippines' Clark Air Base in Angeles City, during September.

They will be operated by the PAF's 15th Strike Wing at Danilo Atienza Air Base, Cavite, near Manila and will supplement the remaining North American Rockwell OV-10 Broncos, also operated by the Wing. The A-29Bs were ordered under a contract announced on November 30, 2017.

Four of the Super Tucanos arrived at the base on September 19 at 1306hrs local time, but two were delayed in New Delhi, India, awaiting clearance



Above: One of the six new Philippine Air Force Embraer A-29B Super Tucanos, wearing ferry registration PT-ZZN, departing from Luqa Airport, Malta, on September 10 during its delivery flight. It had arrived the previous day from Alverca Air Base, Portugal, then continued to Sharm El-Sheikh, Egypt Ruben Zammit

to continue their journey. They finally arrived on October 1.

Embraer pilots left with the aircraft on August 29 from the company airfield at São José dos Campos, Brazil. They made refuelling

stops en route in the Canary Islands, Portugal, Malta, Egypt, Bangladesh, the UAE, India, Thailand and Vietnam before landing in the Philippines. They will train PAF aircrew to fly the Super Tucano for

two months as part of an agreement with the PAF Technical Inspection and Acceptance Committee.

The six A-29Bs comprise serial numbers 1901 to 1906 inclusive, but these were taped over. Ferry

registrations PT-ZZM, PT-ZZN, PT-ZZO, PT-ZZQ, PT-ZZS and PT-ZZU respectively were used for the delivery flight. The six aircraft construction numbers are, respectively, 31400250 to 31400355.

Philippines Air Force receives new Gulfstream G280

A FORMAL ceremony was held on September 21 at Clark Air Base, Pampanga, for the delivery of a new Gulfstream G280 command and control aircraft for the Philippine Air Force (PAF).

Held at the base's Haribon Hangar, the event was led by Armed Forces of the Philippines (AFP) Chief of Staff Lieutenant General Gilbert Gapay, together with the Secretary of National Defence Delfin Lorenzana and Commanding General, Philippine Air Force, Lieutenant General Allen Paredes.

The Gulfstream G280, serial number 1251 (c/n 2199, ex N290GA), will be primarily used by the PAF to transport senior leaders and commanders in the event of a crisis. It will also be operated as an airborne post for command and control (C2) operations, as well as an airborne warning

system and for medical evacuation, high-altitude atmospheric research, and intelligence, surveillance and reconnaissance.

The aircraft was acquired under the AFP Modernization Program and purchased from Gulfstream Aerospace through a foreign military sales contract awarded by the USAF on September 17, 2019. The deal also includes parts, tooling and two years of contractor logistics support for sustainment of the aircraft.

It departed on its delivery flight from Dallas-Love Field, Texas, on September 17, routing initially to Long Beach, California, then via Hawaii and Guam to the Philippines, where it landed on September 20.

Following the official acceptance ceremony, it operated its first mission later that day, transporting medical supplies to Davao City in response to the COVID-19 pandemic.

Textron strikes deal for 12 T-6TH

TEXTRON AVIATION Defense is to supply the Royal Thai Air Force with 12 Beechcraft T-6C Texan IIs for delivery between late 2022 and early 2023.

The first two of the 12 will be ferried to Thailand from Wichita, Kansas-based Textron Aviation Defense by air. The remaining ten will be dismantled and

transported in crates to Kamphaeng Saen Air Base. The T-6C Texan II will be known as the T-6TH in Thailand, and Thai pilot training will begin in Wichita in 2022.

The overall contract with the Royal Thai Air Force is for an integrated training system for the Royal Thai Air Force Flying Training

School at Kamphaeng Saen air base.

The Royal Thai Air Force contract, announced on September 28 for an undisclosed sum, includes ground-based training for pilots and maintenance professionals, a mission planning and debrief system and ground support equipment.

Four more Afghan Super Tucanos arrive

AN ADDITIONAL four Embraer A-29B Super Tucanos were handed over to the Afghan Air Force (AAF) at a ceremony in Kabul on September 17.

The aircraft wore USAF serials for the ferry flight, with AAF serials taped

over. They comprised 13-2003 (c/n 31400203, to be YA1403), 13-2005 (c/n 31400205, to be YA1405), 13-2011 (c/n 31400211, to be YA1511) and 13-2016 (c/n 31400216, to be YA1516).

The AAF has now received 18 Super Tucanos

and a further six are scheduled to arrive in February 2021. The latest arrivals departed from Moody Air Force Base, Georgia. On August 23, they briefly stopped at Glasgow-Prestwick Airport in Scotland, before continuing to Nice, France. They arrived in Kabul on August 28.

Afghanistan's acting Minister of Defence, Asadullah Khalid, said: "These planes, are a message that NATO is committed to the Afghan Forces, and shows this will continue until the defeat of terrorism in the country and the region."



Above: One of the four newly-delivered Afghan Air Force A-29B Super Tucanos during the official handover ceremony in Kabul on September 17. A further six are due to arrive next year NATO

Indonesia wants to buy Austria's Typhoon fleet

AUSTRIA'S DEFENCE Ministry is in negotiations for the sale of its entire Eurofighter Typhoon fleet to Indonesia.

In a formal letter sent on September 4 to her Indonesian counterpart, Prabowo Subianto, Austrian defence minister, Klaudia Tanner, said Austria was "happy to accept your interest in purchasing the 15 Austrian Eurofighters, to modernise your air fleet, and will now examine this in detail."

The surprise proposal had first surfaced on July 10, when Indonesia sent an unsolicited proposal to Austria offering to purchase the aircraft. It has taken nearly two months for Tanner's formal response to be made.

Austria has been seeking

The first Austrian Air Force Eurofighter Typhoon, serial '7L-WA', arriving over Zeltweg air base, Austria, after its delivery flight on July 12, 2007 Bundeswehr Markus Zinner



a buyer for its Eurofighters since 2017. They have been expensive to maintain and are unable to meet the Austrian Air Force's future requirements. To reduce costs, the original Austrian order was cut from 18 to 15, with only a basic equipment fit for

air-policing missions. Six are second-hand former German Air Force aircraft.

To finalise the sale, a re-export agreement would have to be reached with the four Eurofighter partner nations – Germany, Italy, Spain and the UK. In addition, US approval

would be required, because the aircraft contains US equipment. Austria's parliament would also have to clear the deal.

There may also be political opposition in Indonesia, where the emphasis is on buying locally-built military

equipment, although the country does not currently produce aircraft that would be a suitable alternative.

Tanner acknowledged that the sale to Indonesia is likely to be: "very complex and difficult". She has yet to announce plans for the type's replacement.

RSAF KC-135s to be US refuelling service

META AEROSPACE, a Washington-based defence services provider, has acquired the four retired Republic of Singapore Air Force (RSAF) Boeing KC-135R Stratotankers, the firm announced on September 30.

Meta states that the aircraft will be used to deliver turnkey aerial refuelling services to meet its US government customer's requirements. The first to be delivered to the company, civilian registration N573MA, was US registered on September 22. It left Singapore's Changi

International Airport on September 29 for March Air Reserve Base, California, to be prepared for operations. The remaining three were scheduled to join it in October and November.

The second aircraft to be registered was allocated N572MA on September 22. Registrations reserved for the remaining two are N569MA and N571MA. The aircraft had all been retired last year and placed in open storage pending sale. They have been replaced by six Airbus A330 Multi-Role Tanker Transports.

The KC-135R registered

as N573MA has the construction number 18633, and its serial number is 753 for the RSAF and 63-8016 for the USAF. The Stratotanker N572MA

has the construction number 17942 and the serial numbers 752 for the RSAF and 59-1454 for USAF. The third and fourth KC-135s: N569MA

and N571MA have the construction numbers 18626 and 18232; the RSAF serials 750 and 751, while for the USAF they are: 63-8009 and 61-0325.



An ex-Republic of Singapore Air Force Boeing KC-135 Stratotanker takes off from Changi Airport, Singapore just after 0900hrs local time on September 29 with its new civilian registration N573MA. It also carries the name 'Timothy Dalton' on its nose, named after the James Bond actor. The KC-135 is one of four ex-Republic of Singapore Air Force Stratotankers that have been bought by a civilian organisation. Their ultimate operator is not known. The other three aircraft civil registrations are N569MA, N571MA and N572MA Hans Jacobs



Third Bangladesh C-130J delivery

Left: On September 16, the third ex-Royal Air Force Lockheed Martin C-130J Hercules departed Cambridge, UK, on its delivery flight to Bangladesh, where it will become operational with the Bangladesh Air Force. It arrived in Bangabandhu on September 17 Peter Foster



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A decade ago, we would not have imagined Aero L-159s, Atlas Cheetahs and Dassault Mirage F1s fulfilling a military role in the USA. But that's what is happening now, as the USAF awards private air forces more contracted-out close air support (CAS) and aggressor work.

Using private adversary-air, or 'Red Air' contractors, is nothing new. Both the US Navy and USAF have done so sparingly in recent times. Never, though, on the scale that Air Combat Command (ACC) outlined in phase one of its multi-award Combat Air Force Contracted Air Support (CAFCAS) contract during late July.

In addition to the 21,700 hours of aggressor flying awarded over the next four years, there will be approximately 10,000 hours of training army joint terminal air controllers (JTACS) — and we can expect more of the same over the next few months.

Three big winners

The civilian Red Air mission winners are Airborne Tactical Advantage Company (ATAC) out of Fort Worth, Texas; Tactical Air Support (TacAir) located at Reno, Nevada; and Draken International from Lakeland, Florida. All are now set to fly their outdated fighters but with very experienced ex-military

pilots, often with more than 3,000 flying hours, against USAF pilots in their cutting-edge fighters at five US air bases.

The successful trio were among seven companies awarded an indefinite delivery, indefinite quantity contract (IDIQ) in October 2019, allowing them to bid for work at 22 locations, up to 12 for adversary-air, and ten for contract close air support (CAS).

In contrast, Canada's Top Aces, which has a US subsidiary, and Air USA, Blue Air Training and Coastal Defense only bid for the air-to-ground contracts.

The latter work primarily with JTACS, airborne forward air

controllers (AFACs) and FACs.

Under phase one of CAFCAS, these three big winners will deploy jets to Kingsley Field, Oregon (working with the 173rd Fighter Wing/Oregon Air National Guard, an F-15C/D flying unit); Luke Air Force Base (AFB), Arizona — with the 56th Fighter Wing, an F-35A unit; Holloman AFB, New Mexico (54th Fighter Wing — an F-16C/D unit); Seymour Johnson AFB, North Carolina (4th Fighter Wing — an F-15E Strike Eagle unit) and Kelly Field, Texas (149th Fighter Wing/Texas Air National Guard — an F-16C/D unit).

There are many reasons behind the USAF taking this route, but the



Red Air

bottom line is that military leaders do not want their valuable F-22A Raptors, F-35 Lightnings as well as upgraded F-15C and F-16Cs to be used in non-combat missions.

Preserving fighters

US taxpayers are being asked to stump up a whopping \$40,000 per flying hour for the F-35, and \$60,000 to fly the F-22A Raptor, so another option must be found. The military wants to preserve the service life of these valuable fighters and to keep them at a high level of readiness.

The USAF also has a 2,000-pilot shortfall, so even if it had the aircraft, the money and the

hours, it wouldn't have the pilots. As one source told *AFM*: "That impacts them in two ways – they don't have enough to supply the adversary units, and they need more [contracted] adversary pilots to train the pilots they do have to alleviate the shortfall.

"Another important reason is the US military just don't have enough aircraft to meet their requirements and, in the time it takes to build up a dedicated adversary force, mature it and stand it up, they cannot meet the demand for sorties.

"So these civilian adversary-air companies that have grown in the past few years can act with a little

more agility and bring the USAF that capacity."

Much of the upturn in civilian Red Air can be traced back to the disbandment of the 65th Aggressor Squadron at Nellis AFB in September 2014. By the end of November 2015, Draken International – which had amassed a fleet of former military aircraft, including 17 Aero L-159 Honey Badgers – won a contract to replace the 65th with adversary support.

Cutting costs

Lt Col Michael Shepherd, deputy commander of the 57th Adversary

Tactics Group, was frustrated at the closure of the 65th: "The need for adversaries was as great as it ever was, if not more so," he said.

"While we still have the need to produce adversary aircraft, we simply don't have the air force assets. That's why Draken has been contracted, because they can do it cheaper and because they can still represent adversary tactics."

After a year-long trial at Nellis AFB, ending in early 2017, the USAF stated it would request bids for CAFCAS, with effect from January 2019, to provide nearly 40,000 hours of aggressor support at 12 bases. The contracts were originally ►



TacAir's fleet of ex-Royal Jordanian Air Force F-5E/Fs are being upgraded with a Garmin 3000 digital avionics suite, as well as a Duotech Systems Nemesis 2 radar TacAir

rising

Financial restraints in recent years have forced the US Air Force to award big contracts to private air forces for aggressor work.

Alan Warnes reports on the war games



Above: ATAC has acquired 63 ex-French Air Force Mirage F1s and, by mid-September, 40 of them had been registered with the Federal Administration Agency. This example, 629/N618AX, was formerly based at Mont-de-Marsan (Base Aérienne 118) coded '118-QW' ATAC

worth up to \$6bn and would work in addition to the two USAF aggressor squadrons. Since 2017, companies have spent billions of dollars building their own fleets of fighters preparing for the Red Air gold rush.

Building the fleets

ATAC was obviously pleased to win the work with the F-35A at Luke AFB and F-16C/Ds at Holloman AFB – two bases worth up to 3,100 sorties annually. Then later they were awarded the Eglin contract. John Rock, global military sales manager at ATAC, told reporters on July 21: "Winning Luke is a feather in our cap, because it will involve flying with the F-35."

Founded in 1994, ATAC was acquired by Textron Airborne

Systems in 2016 and has flown mainly with the US Navy. In July 2017, it purchased 63 ex-French Air Force Mirage F1s to operate alongside 18 Hawker Hunter Mk58s (on loan from Lortie Aviation in Canada), four L-39ZAs and six ex-Israeli Air Force F-21 Kfir C2s. It is now set to become the largest private supersonic air force in the world.

Another four ex-French AF Mirage F1Bs have been registered to Paramount Aerospace Systems USA – the South African company's US arm, based at Fort Worth; coincidentally, where ATAC is based. All four were acquired by Secapem at Nîmes in France, as part of a strategic alliance with Draken International, but that relationship ended and they are

now in the United States.

Buying a new fighter fleet, according to vice-president of business operations at ATAC, Rich 'Miggs' Zins, is the hardest part of the business: "It's a huge industrial undertaking – identifying them, then evaluating them for suitability, because most of the retired aircraft have used up most of their useful life," he told AFM. "Just because they are on the market doesn't mean we can use them."

He added: "The airworthiness and safety checks, along with establishing a logistics chain, is huge, the import regulations are massive and you have to regenerate the aircraft because none of the F1s are in flying status. It could be done faster, but we

wanted to match the budget with the contract cycles. And, of course, the business needs can change by the time you evaluate and buy the aircraft, so it's important they are flexible, adaptable and upgradeable for the market."

Of the 63 aircraft that were acquired by ATAC, 40 have so far been registered with the Federal Aviation Administration (FAA), made up of 18 former Mirage F1CTs and seven F1Bs.

Michael Thompson, senior manager for ATAC air force programmes, told AFM: "We have 12 F1s currently flying, certified by the FAA, including five that are working with the US Navy. We have flown around 100 sorties on the USMC/USN



Draken International acquired 22 ex-Spanish Air Force Mirage F1Ms including this example, N574EM (ex C.14-70), and purchased 25 ex-Royal Jordanian Air Force aircraft. It now has a similar-sized Mirage F1 fleet as ATAC Draken

Right: ATAC also operates a fleet of six ex-Israeli Air Force Kfir C2s, which work with the NAWDC at NAS Fallon, Nevada, where this N402AX was seen in May 2019 Kevin Whitehead





ATAC's first Mirage F1, dual-seater F1B N601AX a former French Air Force 502, made its first flight on August 22, 2019 ATAC

contract. All 12 should be certified by the USAF in September and more going forward."

ATAC has seen its aircraft flying alongside the likes of the US Marine Corps (USMC) and US Navy's aggressor units. "We integrate our tactics with them and that's the reason we need high-performance aircraft. We always try to buy the right aircraft with the right flight characteristics so we can fly the right tactics," said Thompson.

TacAir support

Reno-based Tactical Air Support (TacAir) was awarded the Commercial Adversary Support contract for the USAF Air Combat Command's Kingsley Field Air National Guard (ANG) base in

Klamath Falls, Oregon.

TacAir will fly its fleet of modernised F-5AT (Advanced Tiger) aircraft in support of the USAF's only F-15C Eagle training squadron by providing an adversary force for student and instructor mission support.

Mick Guthals, TacAir's senior business development manager, told *AFM* on September 3: "We should start flying at Klamath Falls around the week commencing September 21.

"There will be four F-5s up there, tasked for two sorties in the morning and two in the afternoon. If the tasking changes we will increase it up to six."

TacAir is now upgrading the 21 former Royal Jordanian Air Force (RJAF) F-5Es and F-5EFs

it purchased back in spring 2017. They are all being modernised with fourth-generation capabilities comprising a Duotech Systems Nemesis 2 radar and Argus Radar Warning Receiver (RWR), as well as a new-look cockpit configured with a Garmin 3000 digital avionics suite integrated through a Curtiss Wright mission computer. And, instead of a head-up display, the pilot will use a Thales Scorpion Helmet-Mounted Sight and Display (HMSD), interchangeable between helmets and pilots — not surprisingly, these jets are known as the Advanced Tiger.

After arriving at the company's airworthiness depot at St Augustine, Florida (where Northrop Grumman continues to support the USN/USMC F-5s),

TacAir put the fighters through a phase one flight test programme and then flew them up to Reno for upgrading. As of September 30, seven aircraft have gone through the modernisation.

Draken shake-ups

In April, Draken International saw a management team shake-up, with the former president of DynCorp International, Joe Ford, joining as its new CEO. He succeeds Jared Isaacman, Draken's founder and CEO since 2011, who becomes the non-executive chairman of the board of directors.

The shake-up came partly because Draken was slow to transition to the Mirage F1. The Florida company received the ex-Spanish examples in 2018, ▶

"We integrate our tactics with them and that's the reason we need high performance aircraft. We always try to buy the right aircraft with the right flight characteristics, so we can fly the right tactics"



but the first one didn't fly until November 2019, and the RJAF fighters only arrived in April. That meant getting the fleet ready by September 2020, when these first contracts started, therefore proved impossible.

The company operates the biggest private air force in the world, comprising 17 operational ex-Czech Air Force Aero L-159E Honey Badgers (between 2017-

19), four Aero L-39Cs and a L-39ZA; 12 ex-South African Air Force Atlas Cheetahs, 13 ex-Royal New Zealand Air Force Douglas A-4K/TA-4K Skyhawks and 22 ex-Spanish Air Force Mirage F1Ms acquired in 2018, although only 18 of the single-seaters are on the FAA register.

In April, Draken also took delivery of the first of 25 ex-RJAF aircraft, made up of Mirage F1CJs, F1EJs

and two dual-seat Mirage F1DJs. The first delivery was a F1DJ, serialised 118 and having served the Qatar Air Force, Spanish Air Force, RJAF and now Draken — one of the most travelled F1s in the world. The company also has 25 ex-Polish Air Force MiG-21bis that have never flown operationally in the United States.

Also in April, Bill 'Sweet' Tart was elected Draken's chief

operating officer from DynCorp International, where he had been senior vice-president of business development. He told *AFM* in early September: "Each of Draken's fleets, including our F-1s, are currently performing training roles at Nellis AFB, the home of the fighter pilot. Nellis AFB leadership determines the training requirements for USAF Weapons School (ADAIR II), Red Flag exercises and other test and training events, and tasks the Draken team based on those requirements. Whether that's the A-4, L-159, F-1 or Cheetahs in the near future, Draken assigns the most effective aircraft and expert pilot combinations to meet the requirements."

In early September, five F1Ms were operating out of Nellis AFB under the ADAIR II contract. Tart added that Draken was pleased to be awarded with the task orders at Seymour Johnson AFB — which



Above: Draken International took delivery of its 21st Aero L-159 in June 2019. The fighters had very few hours on the airframe, because when the Czech Air Force cut its requirements, most went into storage after being built. This aircraft was formerly 6026 and became N275EM Alan Warnes **Right:** Draken has been working with the 57th Adversary Tactics Group at Nellis AFB, Nevada, since late 2015, with a mix of ex-Royal New Zealand Air Force A-4Ks (seen here is N145EM, formerly NZ6215) and Aero L-159Es Joe Copalman





Four ex-French Air Force Mirage F1Bs were initially stored at Nîmes with Secapem in late 2017, before they were sold on to Paramount at Fort Worth, Texas Alan Warnes

“The US is more interested in ticking the box and under no circumstances can these companies replicate fourth or fifth-generation Russian and Chinese threats”



saw four A-4K Skyhawks arrive in September — and Kelly Field, and it looks forward to more rounds of CAFCAS in the future.

Bottom of the pack

The biggest loser in the CAFCAS awards was Canada’s Top Aces, which operates 16 Dornier Alphajets and ten Douglas A-4 Skyhawks. These have been used predominantly for contracts in Canada, Australia and Germany.

Speaking anonymously with *AFM*, one source claimed that President Trump’s poor relationship with the Canadian government put paid to Top Aces’ chances.

In recent months, the company has acquired the 28 Alphajets of the Belgian Air Force, currently being stored at Belgium’s Beauvechain Air Base, and up to 29 F-16A/Bs from Israel.

A company spokesperson recently stated: “We are currently finalising third-party transfer with the US Department of Defense

and expect them in Mesa, Arizona, in late 2020, where our US headquarters is based.”

But while it is all very well providing large numbers of civilian fighters as aggressors, a cynic could question the type of threats. A game changer would surely be to provide BVR (beyond visual range) and datalink capabilities with a network-centric capability within the red forces, to mimic Chinese and Russian threats, so USAF pilots would encounter real challenges.

Or, as someone close to the Red Air scene told *AFM*: “Red Air companies don’t have any of this [capability], so the level of tactics is limited and poor. They are just aircraft to go up and fly against in the way things were done in the 1980s. The US is more interested in ticking the box and under no circumstances can these companies replicate the threat of fourth or fifth-generation Russian and Chinese threats.” *AFM*

CAFCAS Awards

There were 6,518 sorties up for grabs in adversary air, which over the four years are expected to increase to a maximum 26,072 sorties.

Operating Location	Annual Sorties	Max Sorties	Winner
Kingsley Field, Oregon	800	3,200	TacAir
Luke AFB, Arizona	1,530	6,120	ATAC
Holloman AFB, New Mexico	1,558	6,232	ATAC
Eglin AFB, Florida	1,100	4,400	ATAC
Seymour Johnson AFB, NC	1,000	4,000	Draken
Kelly Field, Texas	530	2,120	Draken
TOTAL:	6,518	26,072	



Phantom

The US and China's increasingly belligerent war of words warns of potential conflict in the Indo-Pacific region. **Rob Coppinger** examines whether their threats are credible

Above: United States Air Force, Navy, Marine Corps and Japan Air Self Defense Force (JASDF) aircraft conducting a large-scale joint and bilateral integration training exercise on August 18, 2020. Four Boeing B-1B Lancers, two Northrop Grumman B-2 Spirit bombers and four JASDF Boeing F-15C Eagles also took part in Bomber Task Force missions simultaneously within the Indo-Pacific region over the course of 24 hours
USAF/Staff Sgt. Peter Reft

The US has continued to make provocation against China, seriously undermining China's sovereignty and security, and damaging relations between the two countries and their armed forces," said the People's Republic of China's Ministry of National Defense spokesman, Senior Col Wu Qian, on August 27. The rhetoric between the United States and China has become increasingly harsh in 2020. China is critical of US military activity in the region, while the US continues to send bombers and aircraft carriers through the South China Sea.

The US Congress has been preparing to fund an augmented US Air Force presence in the

Western Pacific to challenge China. Departing from its Barksdale Air Force Base (AFB) in Louisiana in July, a Boeing B-52 Stratofortress participated in a maritime exercise with the USS *Ronald Reagan* (CVN-76) and USS *Nimitz* (CVN-68) aircraft carrier groups in the South China Sea. From the 2nd Bomb Wing 96th Bomb Squadron, the B-52 flew a 28-hour mission to "demonstrate US Indo-Pacific Command's commitment to the region," the USAF stated on July 8.

China's People's Liberation Army Air Force (PLAAF) bombers, such as the Xian H-6, and fighters routinely fly through neighbours' air defence identification zones (ADIZ);



menace?

self-declared airspaces that sit between international airspace and a nation's landmass. The ADIZ is monitored for aircraft movements to ensure unknown or potentially hostile fighters or bombers do not enter a nation's actual airspace. China has also laid claim to much of the South China Sea, building up small islands for runways – claims which have been defeated in an international court (see 'China's international law loss' on page 36).

The emphasis the US is now placing on the Western Pacific region was reinforced by a speech from the US government's Secretary of Defense, Mark Esper, on August 27 in Honolulu, Hawaii. He said that China

is threatening the basis for prosperity in the Indo-Pacific region, and that like-minded nations must band together. "One of the goals that drives our implementation of the [national defence] strategy, is to focus the [defence] department on China," Esper stated. The national defence strategy states that 'near-peer' conflict is what the US should be preparing for.

The US Department of Defense (DoD) has already created a new policy office to counter China, the China strategy management office, to integrate the DOD's efforts to deter China. The importance of the Pacific region was also underlined when the USAF Pacific air forces

commander, Gen Charles Q Brown Jr, was appointed Chief of Staff of the Air Force in July, making him the highest ranking officer who acts as an advisor to the President, Secretary of Defense and the National Security Council.

Weapons range

When US President, Barack Obama, spoke of a pivot to Asia Pacific from Europe for the focus of US military activity, the reality did not match the rhetoric. "It really hasn't been until very recently that we've actually put sizeable investments, both money as well as manpower, in the Pacific," says China Aerospace Studies Institute (CASI) director, Brendan Mulvaney. ▶



Left: A People's Republic of China People's Liberation Army Air Force Chengdu J-10S fighter participates in a Russian Aerospace Forces international Aviadarts competition Russian Federation Ministry of Defence
Below: USAF Chief of Staff, Gen. Charles Q. Brown Jr, was previously the Pacific Air Forces (PACAF) commander, Air Component Commander for US Indo-Pacific Command; and executive director, Pacific Air Combat Operations Staff. On October 17, 2019, as PACAF Cmdr he gave an address detailing his priorities in the Indo-Pacific region to the men and women of Osan Air Base, Republic of Korea USAF/Staff Sgt Benjamin Bugenig



China's international law loss

In 2016, the Permanent Court of Arbitration (PCA) ruled against China's claims on territory in the South China Sea. In the case of the Republic of the Philippines versus the People's Republic of China, the court found in favour of the Philippines. The PCA, established by treaty in 1899, is an intergovernmental organisation providing dispute resolution services to the international community. China has been a 'contracting party' to the conventions of the PCA since the early 20th century. However, China chose not to represent itself at the court for this case. China stated in its December 2014 position paper that the Court has no jurisdiction over the matter. The PCA studied this matter and concluded that it did have jurisdiction. The Court went on to assess the Chinese claims in the South China Sea. It found no evidence that China had historically exercised exclusive control over the waters or their resources. As such, there was no legal basis for China's claim to most of the South China Sea. The PCA did find that China had violated the Philippines' sovereign rights in its exclusive economic zone, which extends 200nm (370km) from the Philippines' shore. The court decided that, by constructing artificial islands and allowing Chinese fishermen to fish close to the Philippines, China had interfered with Filipino fishing and petroleum exploration.

Below: An United States Air Force Boeing F-15 Eagle takes off during an aviation training relocation at Misawa air base, Japan on December 15, 2015. Fifteen F-15s from Kadena air base, Japan, trained during a two-week exercise alongside Japan Air Self-Defense Force aircraft USAF/Airman 1st Class Jordyn Fetter

The Institute is part of the USAF's Air University. Mulvaney added that it was in part due to the US still being in Iraq that slowed the pivot to Asia Pacific.

Where that investment is deployed is now a hot topic of debate. The deployment of US forces can be traced back to World War II and the Korean and Vietnam Wars. The Air Force's presence was designed to be very efficient, with as many forces as possible in one spot for economies of scale. The two sides of the debate are 'stand-in' or 'stand-off', defined as being within range of an enemy's weapons or being beyond their reach.

Stand-in may have won already, due to the choices of US legislators in their latest bill for military spending. This year's National Defense Authorization Act (NDAA) calls for a forward base of Lockheed Martin F-35 Lightning II fighter jets to be deployed quickly. The NDAA determines how the US government invests its military spending, and how much investment there is. The Act for the 2021 fiscal year has an emphasis on Asia Pacific. Mulvaney agrees this NDAA is more focused on the Pacific region than previous ones.

The NDAA bill is not expected to be voted on until after the Presidential election on

November 3. Data analytics firm, Govini, studies US government spending. Its chief strategy officer, James Mitre, previously worked on military posture at the DoD. He has an answer for that F-35 basing decision: "The question right now is, how is the Air Force going to be able to penetrate the teeth of Chinese air defences, and be able to strike targets in a contested environment."

In Mitre's view, a previous milestone for US military involvement in the Pacific was the US government's 2018 national defence strategy: "The national defence strategy prioritises China and Russia as a class above all other challenges." In July, Mitre co-wrote an article about the USAF's choices for the 104-year old think tank, Brookings Institution. Mitre and his co-author recommended the Air Force prioritise China as the principal military challenge. However, Mitre sees potential obstacles ahead, with budget belt-tightening due to COVID-19-related economic hardship.

China's military does not suffer from budgetary problems. In the US DoD's latest report on Chinese military development, published on September 1, it states: "In 2019, the PRC announced its annual military budget would increase by 6.2%, continuing more





A United States Air Force Boeing B-52H Stratofortress bomber, deployed from Barksdale Air Force Base in Louisiana, lands at Andersen Air Force Base in Guam, on July 4, 2020. The B-52 participated in a 28-hour mission to demonstrate the US Indo-Pacific Command's commitment to the security and stability of the region. USAF/ Master Sgt Richard P. Ebensberger

than 20 years of annual defense spending increases." The DoD report, *Military and security developments involving the People's Republic of China 2020*, also says China remains the second largest military spender after the US. The PLAAF and China's naval air wings combined, have about 2,000 combat aircraft, according to the report.

The Chinese government's own think tanks conclude that China has no option but to bolster its military. On June 24, China's National Institute for South China Sea Studies published its report, *The US Military Presence in the Asia-Pacific 2020*, in which it states: "The US has forward deployed a large number of its forces, strengthened and deepened its military alliances and conducted intensive military activities targeted at China. With a growing sense of being threatened, China has no alternative but to build its military forces."

Air dominance

When deciding how to build up its military, the Chinese have studied the West 'studiously', according to Mulvaney. The country has concluded that air dominance is how the US has won. Win the skies and that allows ▶



Above: A People's Republic of China People's Liberation Army Air Force Xian H-6 bomber photographed by Japan Air Self-Defense Force in November 2015 Japanese Ministry of Defence Below: A People's Republic of China People's Liberation Army Air Force Shaanxi Aircraft Corporation Y-9 GX-8 electronic intelligence variant photographed by the Japanese Ministry of Defense in January 2016 Japanese Ministry of Defense



Above: A People's Republic of China People's Liberation Army Air Force Chengdu J-10B Vigorous Dragon fighter on display at the Zuhai Air Show in Guangdong province in 2018





Left: United States Air Force Fairchild Republic A-10 Thunderbolt IIs assigned to the 25th Fighter Squadron at Osan Air Base, South Korea, fly in formation during a routine training mission in the Indo-Pacific, over the Farallon de Medinilla Range, Commonwealth of Northern Marianas Islands, on August 19, 2020. The Farallon de Medinilla Range is an uninhabited island commonly used for routine flight training USAF/Senior Airman Michael S. Murphy

Below: A Chengdu Wing Loong UAS on static display at the Russian MAKS international aviation and space salon in 2017 FFA P-16/Wikimedia



the ground and naval forces to carry out their missions. "The Chinese have learned that lesson and they've learned it very well," Mulvaney says.

For Mulvaney, China is "playing a home game." It is all about protecting the homeland. Taiwan, Japan and South Korea are all within its air force's range.

To win that air dominance, China has been investing in air-to-air missiles, says Mulvaney: "Their air-to-air munitions are actually pretty good and, in some cases, actually can outreach us. So, it's really [a case of] if I could shoot my missile further than you could shoot your missile, I win." By outreach, Mulvaney is referring to beyond-visual-range missile attack. Air combat has become a battle of radar technology and missile intelligence. While Mulvaney says the missiles are good, in his view, the aircraft that China is producing are not "on par with Western aircraft."

China's latest operational fighter is the Chengdu Aircraft Industry Corporation J-20. In an article on its China Power Project website, the Center for Strategic & International Studies (CSIS) states that it is one of two Chinese stealth fighters, the other being the Shenyang Aircraft Corporation FC-31, which is still being tested. The CSIS article states: "The two Chinese stealth fighters may have been designed to complement each other in a similar manner to the planned deployment [of the F-22 Raptor and F-35 by the US]."

The F-35B Lightning II will operate from US Navy amphibious ships. CASI's analysts expect the Shenyang Aircraft Corporation J-31, a naval variant of the FC-31, to operate from China's

aircraft carriers. China is building its third aircraft carrier, despite the geography of the region allowing China to defend itself from its homeland bases. Mulvaney said: "There's a lot of debate as to how good those are going to be", given they are diesel-powered, not nuclear like the US carriers.

The other question is how many carriers is China going to build? "How many do they really need to hang out in the Western Pacific?" Mulvaney asks. He explains that, with maintenance constraints, China has to have at least three carriers to ensure one is always out at sea on patrol. For Mulvaney, this means the Chinese opt for nine, because then it can have three at sea at any one time and "maybe five that you could surge at any particular time based on maintenance schedules."

James Mitre questions the efficacy of aircraft carriers and their air wings in a region where rockets can do so much damage: "There are broader discussions about the role of a carrier air wing in a high-intensity war and whether it has the legs that it needs... given the range of China's [Anti-Access Area Denial (A2/AD)] capabilities. That's a long ongoing active debate." China's A2/AD capabilities are those rockets, and an air wing may simple not have the range to act from a stand-off position.

A chain of bases

One solution for the US is to have a more distributed array of air bases across the region, making it harder for China to hit everything at once. Mitre points to a speech from June 2010 when the then Secretary of Defense, Robert

Gates, outlined a more "operationally resilient" and "geographically distributed" Pacific posture. This would extend US bases into Southeast Asia for stronger alliances. China's problem is that it is feared by its neighbours, such as Vietnam, Malaysia, Singapore and the Philippines.

However, a problem for the US is the expense of such a proposal. "The Air Force has not significantly invested in making its Pacific posture more resilient, in large part because the bills are tremendous," Mitre explained. Changing the operational capabilities of an air wing incurs "a huge, huge cost," he adds. Logistics is another challenge: refuelling and maintaining aircraft at dispersed locations. According to Mitre: "A decision needs to be made. Either the Air Force [commits] to being resilient, in light of China's A2/AD capabilities, or relies on long-range strikes."

Understanding how to fight China, whether it is stand-in or stand-off, centralised bases or distributed, might be helped by simulation software. There is a commercial wargaming software called Command: Modern Air/Naval Operations (CMANO), which is produced by the UK-based Slitherine Software, and a professional version is used by the military. Situations such as conflict in the South China Sea has been available as a CMANO simulation and the founder and director of development of CMANO, Dimitris Dranidis, has said: that "the attrition numbers are just awful" for Sino-US conflict in the region.

Dranidis explained that the most likely scenario after an "initial pulse of everyone

Eight United States Air Force Lockheed Martin F-16 Fighting Falcons sit on the flightline during a Pacific Weasel exercise at Misawa Air Base, Japan, on June 19, 2020. Pilots use exercises like Pacific Weasel to sharpen their tactical air capabilities and F-16 manoeuvrability USAF/Airman 1st Class China M. Shock



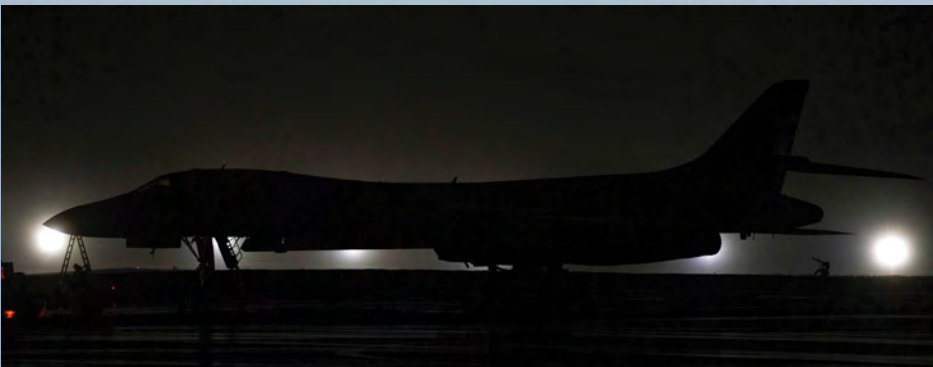


A United States Air Force Boeing B-1B Lancer conducts integration training with the Japanese Air Self-Defense Force (JASDF) near Japan on August 27, 2020. The B-1s integrated with JASDF to enhance bilateral interoperability and mutual readiness between the US and Japan Japanese Air Self-Defense Force



Above: A Boeing B-2 Spirit stealth bomber from Whiteman Air Force Base in Missouri sits on the flightline of Naval Support Facility Diego Garcia, in support of a bomber task force (BTF) deployment, on August 24, 2020. As part of their BTF deployment, the B-2s participated in a combined United States-Australia exercise with Marine Rotational Force - Darwin and Australian Defence Forces USAF/Tech Sgt Heather Salazar

Below: A United States Air Force 9th Expeditionary Bomb Squadron Boeing B-1B Lancer at Andersen Air Force Base (AFB), Guam, on May 1, 2020. About 200 airmen and four B-1s assigned to the 7th Bomb Wing at Dyess AFB, Texas, deployed to the Pacific in support of the Bomber Task Force (BTF). The BTF is based at Andersen AFB to support Pacific Air Forces' training efforts with allies, partners and joint forces, as well as to perform strategic deterrence missions to reinforce the rules-based order established in the Indo-Pacific region USAF/Senior Airman River Bruce



expending their forces, is you have a cooling-off period where everyone is trying to regroup and basically licking their wounds." The initial confrontation would likely be followed by a lull in the conflict to allow both sides to resupply.

Dranidis notes that, in that first strike and counterstrike, "the key players fully commit themselves, instead of doing any half measures, [and it] is going to be very violent." That high attrition rate is due in part from the potentially huge number of Chinese ballistic missile attacks.

Mulvaney agrees that missiles have been a major investment for China: "You see massive investment [and] you also see the creation of the rocket force. They changed the status of what used to be the second artillery and upgraded it, and they made it the rocket force." All of which shows the significance that China's President Xi Jinping thinks rockets are going to play in any future conflict.

Mulvaney predicts future Chinese investment will focus on those rockets, air forces and the navy: "Naval and air and space forces are getting a lot more attention. The army's kind of the big loser in the whole thing." And that will be because China does not expect to be invaded by ground forces.

However, for all China's rhetoric and investment, Mulvaney does not see a country that is preparing to fight the might of the US military and its allies anytime soon: "They've made huge improvements. None of [their weapon systems] are as good as their Western counterparts, but they're good enough to do what the Chinese want to do." **AFM**



A Cold War heats up

In July, the United States Department of the Air Force published its first Arctic strategy, and preparations are under way for war games at the top of the world, as Rob Coppinger explains

In the Arctic, United States Air Force and Royal Canadian Air Force aircraft conducted air defence operations from September 21-23, under Canadian North American Aerospace Defense Command (NORAD) direction.

Called Noble Defender, this three-day exercise was to demonstrate NORAD's readiness to defend the US and Canada from "competitors who continue to test the two countries' defences", specifically Russia, it was announced. NORAD sees increased Russian military activity. In August, Russian aircraft entering the Alaskan Air Defense Identification Zone were intercepted, as were maritime and bomber formations three times in June.

The noble defenders were USAF Lockheed Martin F-22 Raptor, Lockheed Martin F-16 Fighting Falcon and Royal Canadian Air Force McDonnell Douglas CF-18 Hornet aircraft. They were supported by a Boeing E-3 Airborne Warning and Control System aircraft, Boeing KC-135 Stratotanker and Airbus CC-150T Polaris refuelling tankers. Noble Defender was the second Arctic operation in just two months – nothing like it had taken place previously for the entire year.

The circumference of the Arctic circle

Scientists say low sea-ice levels in the Arctic are now typical of annual ice coverage NASA



Above: Secretary of the Air Force, Barbara Barrett, visited Eielson AFB and Clear Air Force Station on July 8, 2020 to learn more about their roles in Arctic defence. Barrett observed a scenario conducted by 13th Space Warning Squadron Airmen at Clear AFS USAF/Airman 1st Class Aaron Larue Guerrisky

encompasses Alaska, Canada's northern territories, Greenland, the northern-most regions of the Russian Federation, Finland, Sweden, Norway and Norway's archipelago Svalbard.

From August 17-21, the first Arctic air defence exercise of 2020 was conducted from the Beaufort Sea to Thule, Greenland. Covering sparsely populated Arctic areas and at high

altitudes, it involved Royal Canadian Air Force CF-18 fighters, Airbus CC-150T tankers, Lockheed CP-140 long-range patrol aircraft and USAF Boeing F-15 Eagle fighters with McDonnell Douglas KC-10 Extender tankers, and Boeing C-17 Globemaster III transporters. NORAD announced that the "exercise provides us the opportunity to hone our skills as Canadian and US forces operate together with



our allies and partners in the Arctic”.

The two exercises followed the July 21 publication of the USAF’s first Arctic strategy. The United States Department of Defense had previously published an Arctic strategy, but not the USAF. In the USAF Arctic announcement, Secretary of the Air Force Barbara Barrett made clear the importance of the top of the world: “The Arctic is among the most strategically significant regions of the world today,” she said. “This Arctic Strategy recognises the immense geostrategic consequence of the region and its critical role for protecting the homeland and projecting global power.”

The region has “immense geostrategic consequence” because as the ice cover shrinks due to global warming, transportation across it becomes easier, as does the extraction of natural resources.

The strategy estimates that, although the Arctic was once thought to be inaccessible, it contains more than “90 billion barrels of oil reserves, 30% of the world’s untapped natural gas and around one trillion dollars’ worth of rare earth minerals”.

Along with the mining and oil and gas industries, better access to the region is likely to attract other commercial traffic and more tourism; thus an increase in international competition across all these sectors.

Russia’s polar bear

The strategy sets out the challenge of international competition expected from the Russian Federation and the People’s Republic of China. It cites Russia’s Arctic initiatives including the refurbishment of airfields and infrastructure, building new bases and developing an integrated network of air defence with coastal missile systems and early-warning radars. In January, the Russian Ministry of Defence (MoD) publicised training flights of its aerospace forces’ United Aircraft Corporation MiG-31 fighter-interceptors and United Aircraft Corporation Sukhoi Su-24 bomber crews in Arctic conditions. They used roads as runways as part of the training.

“We’ve seen increasing [Russian] military activity,” said the then Air Force Chief of



Above: Two Royal Canadian Air Force C-18s in flight. Canada and the United States co-operate through NORAD, North American Aerospace Command, to defend their Arctic borders against competitor nations
Royal Canadian Air Force



Above: A Northrop Grumman B-2 Spirit assigned to the 509th Bomb Wing at Whiteman Air Force Base, Missouri, receives fuel from a Boeing KC-135 Stratotanker from the 100th Air Refueling Wing based at RAF Mildenhall, Suffolk, on June 18, 2020. The aerial procedure took place during a strategic bomber mission north of the Arctic Circle USAF/Airman 1st Class Joseph Barron



A Lockheed Martin LC-130 Hercules from the 109th Airlift Wing and a Twin Otter from the Canadian Royal Air Force's 440th Squadron at the remote ski-way construction camp during Air National Guard exercise Arctic Eagle, March 1, 2020 109th Airlift Wing/Air National Guard Public Affairs

Regional conflict

Staff General, David L Goldfein, speaking during the Atlantic Council's Scowcroft Center for Strategy and Security's commanders' series 'North Star: The First Department of the Air Force Arctic Strategy', held on July 21 this year. "What we can't afford is a miscalculation or one of our airmen to fall below standards." Goldfein stepped down in August and was replaced by Gen Charles Q Brown Junior.

In June, the MoD reported that four Russian Aerospace Forces' Tupolev Tu-95MS strategic bombers carried out a planned flight over international waters of the Chukchi and Bering, both seas of the Arctic ocean. The flight lasted about 11 hours and the MoD said: "At certain stages of the route, Russian aircraft were escorted by [Lockheed Martin] F-22 [Raptor] fighters of the USAF." The Tu-95MS bombers departed from airfields in the Chukotka Autonomous District and the Amur region.

The strategy document also accuses Russia of regulating "maritime traffic on the Northern Sea Route in ways that may exceed its authority permitted under international law".

Trade routes

China, on the other hand, is not in a position to regulate Arctic traffic. The strategy acknowledges that China is not an Arctic nation, "but it sees the region as important to its long-term economic and security interests". In 2018, China linked its Arctic activities to its 'One Belt, One Road' initiative. This is to create a global network of trade routes for Chinese goods. The Arctic part exists because, as the



Two Royal Canadian Air Force (RCAF) McDonnell Douglas CF-18 Hornets from the 425 Tactical Fighter Squadron, prepare to refuel from an RCAF Airbus CC-150 Polaris tanker on September 20, 2020, in the skies over Labrador during Operation Noble Defender, a NORAD Arctic air defence operation
2020 DND-MDN Canada/Master Corporal Krista Blizzard



A NORAD-directed Lockheed Martin F-22A Raptor intercepts a Russian bomber entering the Alaskan Air Defense Identification Zone, May 21, 2019 NORAD and USNORTHCOM PA

strategy describes it, the region is about China's "strategic ambition toward the [Arctic's] vast quantities of rare earth minerals, hydrocarbons and fisheries".

The US ability to project power both into and from the region comes in part from the two large Alaskan USAF bases, Joint Base Elmendorf-Richardson and Eielson Air Force Base (AFB). The Arctic also has huge

geostrategic importance because "Alaska offers the quickest flight access to strategic locations across the Pacific region and western Russia", the strategy notes. It is because of this that Eielson AFB will be home to squadrons of Lockheed Martin F-35 Lightning II aircraft; deemed a fifth-generation fighter. The strategy stated: "Alaska's unparalleled concentration of fifth-generation fighters will present a highly-effective power projection capability."

While projecting power into the Indo-Pacific and Europe from US territory in the Arctic Circle is important, projecting power across the top of the world will also be a challenge, as the strategy points out: "The area above the Arctic Circle (above 66 degrees North latitude) is vast, almost 2.5 times the size of the continental United States." It adds that the North American Arctic has a much harsher environment than the European Arctic, due to weather patterns. The former also has "significantly less road and maritime infrastructure". It continues: "Alaska epitomises this geographical disparity in infrastructure."



A US Army National Guard CH-47 Chinook, assigned to the 1st Battalion, 207th Aviation Regiment, takes flight for exercise Arctic Eagle 2020 on February 24, 2020, at Joint Base Elmendorf-Richardson, Alaska
Senior Airman Xavier Navarro

A Boeing C-17 Globemaster III is used for training to prepare airmen to operate in arctic environments. The C-17 was going to Travis Air Force Base, California, flying over the Chugach Mountains during cold-weather-aircraft-maintenance-procedures training at Joint Base Elmendorf-Richardson, Alaska, November 19, 2019
USAF/Senior Airman Jonathan Valdes Montijo



A United States Air Force Boeing KC-135 Stratotanker and three Royal Norwegian Air Force Lockheed Martin F-16 Fighting Falcons, as viewed from a US Air Force Boeing B-52H Stratofortress, fly together during Bomber Task Force Europe 20-1, November 6, 2019, over the Barents Sea region of the Arctic Circle
USAF/Airman 1st Class Duncan C. Bevan

It is the largest state (twice the size of Texas)... [with] only 5,600 miles of highway."

Of the bases and infrastructure the US has across the Arctic Circle, 80% are provided by the Department of the Air Force, the strategy states. Large USAF bases, training complexes, satellite command and control stations, and more than 50 early-warning and missile-defence radars make up the air force's installations across Alaska, Canada and Greenland. In its strategy announcement, the USAF referred to the preparations it needs to make for Arctic operations.

"The Arctic's austerity requires specialised training and acclimation by both personnel and materiel," it said. "The ability to survive and operate in extreme cold weather is imperative for contingency response or combat power generation." Secretary of the Air Force Barbara Barrett explained in the statement that, while the harsh weather and terrain call for appropriate preparations and training, the airmen and space professionals "remain ready to bring the nation's Arctic

air and space assets to bear to support the national defence strategy".

That preparation includes the formation of the 109th Airlift Wing's expeditionary ski-way team. Based at Stratton Air National Guard (ANG) base in Scotia, New York, this ANG team's mission is to create ski-landing areas in remote places; an area of snowy or icy terrain which is improved for landing ski-equipped aircraft. In March, for the ANG's exercise Arctic Eagle, a remote ski-way was constructed for a 109th Wing Lockheed Martin LC-130 Hercules and a Royal Canadian Air Force Viking Air CC-138 Twin Otter.

The 109th provides airlift to bases in the Antarctic and Arctic regions, normally flying missions in Antarctica when it is winter in New York and in Greenland during the northern hemisphere's summer. The US Department of Defense's only ski-equipped aircraft are the LC-130s operated by the 109th. The LC-130 is a version of the C-130 Hercules, but is designed with skis as well as wheels, so it can land on snow and ice or on a runway. The ski-way

team consists of airmen from various units throughout the wing.

In the Arctic Eagle announcement, Maj Brandon Caldwell, a pilot in the 109th and a senior ski-way team leader, said: "As the Arctic is beginning to become a strategic region again, people are beginning to take notice of what we do up here every year." The strategy says a "substantial portion" of the air force department's Arctic expertise "resides with the air reserve component". For example, as well as the 109th, the Alaska Air National Guard operates Sikorsky HH-60 Pave Hawk helicopters and Lockheed Martin HC-130 aircraft, and the USAF Reserve has Raptors at Joint Base Elmendorf-Richardson.

The strategy states that the department will "leverage guard and reserve expertise to enhance Arctic training and operations". The ANG Arctic Interest Council of states will work with the department and the collection of guard, reserve and regular air force units – referred to as the "Total Force" – would, in the event of war, fight for the top of the world. **AFM**



Above: Maj Nick Foreman (left) and Maj Chris Bean, 815th Airlift Squadron pilots, fly a Lockheed Martin C-130J Super Hercules. The squadron provided airlift and airdrop support for the army's joint forces exercise Arctic Anvil, October 1-6, 2019 USAF/Tech Sgt Christopher Carranza

The Italian Job

Italy's air force tests its expeditionary capability.

Riccardo Niccoli reports



Fucilieri dell'Aria (air fusiliers) of the 16° Stormo were sent to provide protection on the base
Riccardo Niccoli

The tiny Italian island of Pantelleria sits in the middle of the azure Mediterranean – one corner of an island triangle; along with Malta and Lampedusa – about 100km off Sicily's south coast. It's normally a peaceful spot, where crystal waves lap golden beaches, and the occasional tourist flight lands at the island's airport. A paradise for divers and a tranquil idyll for sun worshippers.

But that all changed on July 30, 2020, when the Italian Aeronautica Militare (AM – air force) arrived.

With its support of NATO actions around the globe dragging its forces further afield, the Italian AM General Staff decided to test its readiness for such deployments, with an exercise called 'Proof of Expeditionary Concepts'. In this operation, several of the force's air capabilities were to be integrated, demonstrating its ability to deploy from small airfields, without huge infrastructure and deprived of the usual means of support.

A small Italian AM detachment is permanently deployed on Pantelleria. It is tasked with a minor air-support role and is based close to the 2,000m-long runway, a facility that is managed by a civil company and mainly used for tourist flights.

Despite its lowly standing, this base does have

some historical significance, as it was completed in September 1939, the month when war in Europe was last declared. Its location, between Europe and North Africa, also endows it with a strategic importance, not reflected in its size.

Pantelleria has a famous hangar, too. It was designed by renowned Italian architect, Pier Luigi Nervi, and constructed from reinforced concrete, inside a hill. At the time, this 340m x 26m structure was ground-breaking. Today, it still accommodates many aircraft, but, during World War Two, the underground complex also housed workshops, generators, water tanks, ammunition depots, stores and barracks.

So it was, its location and facilities made this base an ideal location to host an exercise simulating an AM expeditionary deployment.

The final piece in this logistics jigsaw was



Above: The first Italian F-35B flies over the Mediterranean during the Expeditionary exercise
Riccardo Niccoli

the availability of the AM's first STOVL fighter, an F-35B (MM.7453, coded 32-14) that was assigned to the 32° Stormo in February 2020.

The stealth fighter was quickly integrated with the existing conventional take-off F-35As of the air wing.

Italy has committed to acquiring 90 F-35s in total: 60 F-35As for the air force, plus 30 F-35Bs. These will be divided equally between the air force and the navy.

The first two F-35Bs have already been delivered to the navy, and are assigned to the United States Marine Corps Air Station Beaufort in South Carolina, for training. The third aircraft, produced by the FACO factory at Cameri, Italy, went to the Italian AM. As yet, it is unclear how future deliveries will be made.

Aims and objectives

The goal of the exercise was to deploy a fifth-generation aircraft (the F-35B), with all its related operational, technical and logistical support, to verify its effectiveness and demonstrate its operational capabilities in 'austere conditions'.

This was to include low-grade runways, not fit for combat aircraft operations, and to replicate

being far from their homeland, so lacking the protection provided by the home nation. Many units were involved in order to create this environment. The 32° Stormo provided the F-35B fighter, along with a MQ-9A Predator B unmanned aircraft system to provide aerial surveillance of the island.

The 46a Brigata Aerea participated with C-130J and KC-130J aircraft for personnel, materials, armament and support-equipment transportation and also to provide in-flight refuelling, and the indispensable air landed aircraft refuelling point (ALARP) capability.

The 16° Stormo sent a unit of Fucilieri dell'Aria (air fusiliers), specifically to provide protection to the base, while the 17° Stormo participated with a unit of special forces personnel, tasked with Combat Control – to communicate and co-ordinate air traffic from the ground.

Finally, the 3° Stormo provided the projectable logistic capability, which is also indispensable in ALARP operations.

The Reparto Sperimentale Volo (flying test wing) was also involved in the exercise, managing experimental issues, as some of the activities, such as the ALARP, were being carried out operationally for the first time. ►



Above: The F-35 is re-armed and reconfigured inside the hangar, having been refuelled outside
Right: The famous Pantelleria hangar, designed by renowned Italian architect, Pier Luigi Nervi, was constructed in the side of a hill in 1939
Below: Formed from reinforced concrete, the hangar extends 340m into the hillside
 Images: Riccardo Niccoli



The ALARP is a refuelling technique, similar to the FARP (forward arming and refuelling point), and usually linked with helicopter operations. However, in the ALARP, a normal KC-130J is used to refuel aircraft on the ground, using its standard pods, with no modifications, with the exception of the connections on the refuelling pipe.

During the exercise, the F-35B took off from Amendola, 32° Stormo base, and landed on the runway in 'short landing' mode, taxiing to a specific position, near a parked KC-130J. With the engine running, it then started a hot refuelling procedure from the tanker. After this, the engine was shut off and the aircraft was towed inside the hangar for re-arming and re-configuration procedures (operations that could have been completed in the same sequence outside). At the end of the practice, the F-35B left in 'short take-off' mode, back to its home base, about 630km away.

The Italian AM Chief of Staff, Gen Alberto Rosso, attended the exercise and said:

"I am pleased to underline the Expeditionary capability of the Italian Air Force, in which the F-35B is only one component. Today we demonstrated several capabilities of the air force, and how these allow us to independently project aerospace power, a capability which is fundamental not only for the air force, but for our whole nation.

"It's not only about the F-35B or a C-130, but the ensemble of all these capabilities working together, that allow us to rapidly reach an austere base with a relatively short runway, such as here in Pantelleria, and refuel, re-arm and re-configure an aircraft, and do it in very short time and in safety.

"This capability requires numerous competences and specialist skills. Today we have seen a part of it, but there are many other skills not on display here, that are part of our capabilities.

"Today we demonstrated that the Italian Air Force is one of the few air arms able to truly project its aerospace power.

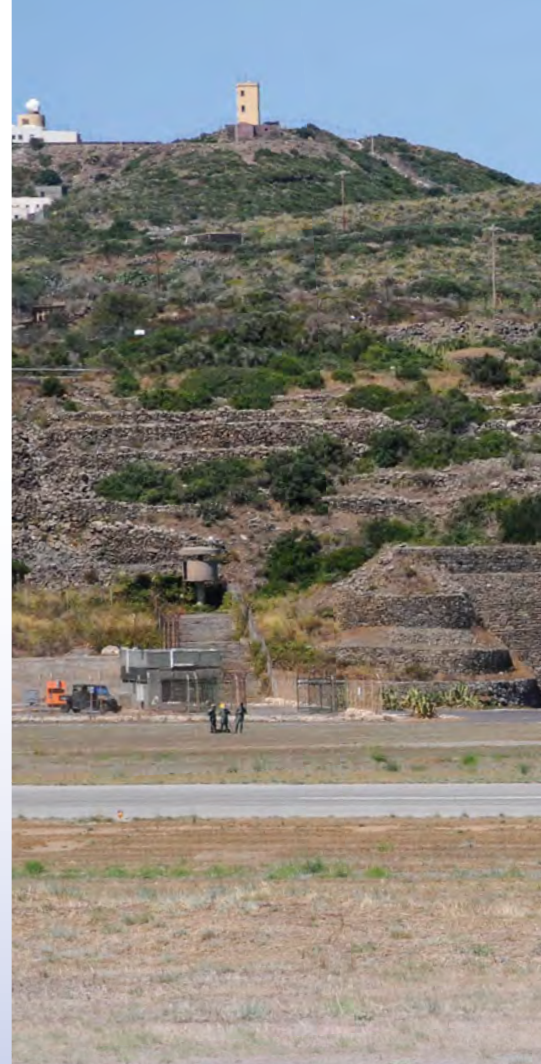
"It's an important capability in the current global situation, which is so changeable and unpredictable, and it means we have the capability to serve our nation."

Gen Rosso was asked why the exercise took place on Pantelleria, in the Mediterranean, and close to the North African coast. Did this have some political value, or was it a signal from the Italian government to those countries to the south of the Mediterranean?

Non-standard runways

He answered: "I wish to underline that there are no political motivations or signals of any kind. We could have selected any other airport with similar features. Our choice of Pantelleria was based on practicalities, but it could just as easily have been Aosta or any other airfield with non-standard runway dimensions, to show our training for this capability.

"Here, we are far from our main bases and this demonstrates that, even overseas, we'll arrive where and when we're needed."





"We demonstrated that the Italian Air Force is one of the few air arms able to truly project its aerospace power. It's an important capability in the current global situation, which is so changeable and unpredictable, and it means we have the capability to serve our nation" – Gen Alberto Rosso

Is this kind of force projection considered necessary, in light of the scenarios that may become more frequent in the future?

He replied: "The need arises from the unpredictability of future scenarios. Unfortunately, history teaches us that, if you prepare to face a certain scenario, you are often surprised by a different one. This issue also influenced our decision to select the F-35B, the reasons for which can be traced back to the Gulf War of 1991.

"On that occasion, we were forced to deploy our Tornados on a base very far (800km) from the area of operations. This meant that, to reach the targets, our planes had to fly additional hours and carry out additional in-flight refuelling, in order to carry the same payload.

"With the F-35B, it's probably not necessary to refuel in-flight, because we can use airfields much closer to the target areas and we therefore have much greater flexibility."

The general added: "Talking of flexibility, ►



Above: The refuelling team practises ALARP refuelling from a standard KC-130J on the ground

Insert: Gen Alberto Rosso speaks to AFM **Left:** The Italian Air Force's first STOVL fighter, an F-35B (MM.7453, coded 32-14) was assigned to the 32° Stormo in February 2020. Here it is about to be refuelled by the KC-130

Below: The F-35B practises air refuelling with the KC-130J from the 46a Brigata Aerea Images: Riccardo Niccoli





Party trick. The F-35B makes a vertical landing on the runway at Pantelleria, in preparation for deployments in "austere conditions" Riccardo Niccoli

if we think about the kind of runways present in the world, in Africa, for example, there are about 100 runways measuring 2,800m to 3,000m long, but there are 20-times more runways measuring 1,000m to 1,500m long. So, you have 20-times greater flexibility to deploy where there could be a need.

"Then, in the case of confrontation in Europe, the flexibility to disperse the aircraft on several airfields and runways certainly provides a greater level of survivability.

"We hope this is an unlikely political issue, but it's our duty to evaluate the potential and to be ready for any possible situation.

"To have an aircraft that can take off from 1,000m to 1,500m runways (the US Marines' doctrine), allows us to use short or damaged runways, or motorway sections, and so provide dispersion, flexibility and unpredictability, that

can greatly help in a potential conflict.

"Many years ago, the Italian Air Force produced a study about acquiring only F-35As, only F-35Bs or a mix of the two. Considering performance, cost and needs around deployment, the air force selected a mixed solution, with A and B models; considered the most economically convenient and effective, considering all possible scenarios."

How is the F-35B situation evolving, given the rumours around joint management of the Italian fleet by the air force and the navy?

"This is one of the issues under discussion. I believe that a joint capability is of value, given the aircraft and the systems in use. Nobody can afford to work alone, so we have to work as a team, because we are a unique defence tool serving our country.

"Despite quarrels, alleged by the media,

I think we have the awareness and desire to serve Italy, each using our own competences and capabilities, to create synergies.

"How much this joint capability can be developed, only the future will tell. It is clear that the F-35B is an aircraft offering incredible flexibility, and it is able to solve a series of problems and satisfy a series of needs, both for the Italian Navy and – to an even greater degree – for the Italian Air Force. To be able to exploit competences and experiences that each force develops to achieve its own tasks; that has to be of benefit to our nation. I am sure this will be the direction we take, without either force trying to overcome the other and with each respecting the other's prerogatives. It is our duty to the taxpayer to work together for a single objective, like a single armed force. It's the most logical and honest solution." **AFM**



Above: Fuel is pumped into the F-35B from the KC-130J's standard fuel pods, using a refuelling pipe with a special connector

Left: Touchdown. The Italian pilot is back on terra firma ready for refuelling and re-arming

Images: Riccardo Niccoli

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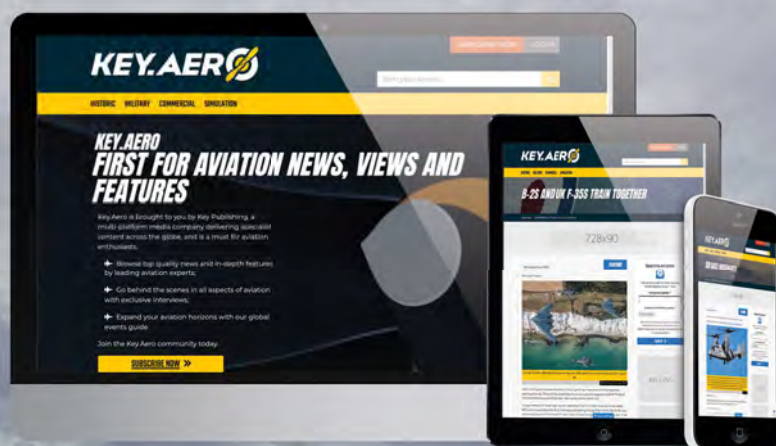
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Warrior



Above: Three patches and a special coin were made for this year's German Armed Forces Day on June 13. The event was cancelled due to COVID-19 restrictions
 Right: The Eurofighter's special livery celebrates the 15th anniversary of the aircraft in service with the Luftwaffe All images by Stefan Petersen

On April 30, 2004, a new era for the Luftwaffe began with the arrival of the Eurofighter Typhoons at Laage Air Base, part of Rostock-Laage Airport in the state of Mecklenburg-Vorpommern, Northern Germany. These multi-role fighters were first part of the German Air Force's 73 Tactical Air Force Wing 'Steinhoff', formerly Fighter Wing 73.

"At the end of 2018, as we approached the 15-year-mark of the Eurofighter, we thought this anniversary has to be celebrated with a special livery," said Master Sergeant Thomas Koeplin, from the air wing's repair and electronics unit.

His idea caught on, and in the spring of 2019 the plans for celebratory livery became concrete. "There was an open competition which resulted in three designs," said Koeplin, who came up with one of the selected designs. He developed the concept with his technical team.

At the same time, Master Sergeant Stefan Thrun of Fighter Wing 71, based at Wittmund Air Base, was also helping with Koeplin's original idea. Thrun had previously designed a 'Baron Spirit' livery for the aircraft, named after the legendary Manfred, Baron von Richthofen – better known as the 'Red Baron' – the officer

commanding the original Jagdgeschwader 1 wing. His 'Baron Spirit' creation went on to win the trophy for best livery at 2019's Royal International Air Tattoo at RAF Fairford in Gloucestershire.

Koeplin told *AFM* that Thrun's computer programming skills and graphics experience were essential in bringing his original idea to fruition.

"It was a fluid process; perceptions from him and me were merged," he said. The colours and shapes were taken from the wing's badge – a crane placed on a stylised Iron Cross in blue and yellow. The combined design was called 'Carbon Warrior' and won the competition.

After financial resources were secured, they looked for a fitting Eurofighter and settled on 31+18. "This jet came directly from overhaul, clean and sheer, ready for foliage," said Koeplin. "Special liveries for Eurofighters aren't painted on but applied with foil. The foliage process isn't that complex; it's fast on and faster off." The technical clearance for ►

colours

The Luftwaffe loves painting its aircraft to highlight important anniversaries. **Stefan Peterson** follows the design of the 'Carbon Warrior' Eurofighter to celebrate the type's 15 years of service



The foil for a single Eurofighter weighs between 60-80kg and covers a total surface area of about 200 square metres



Above: After 15 years of service, the 73 Tactical Air Force Wing is justly proud of the aircraft's 'Carbon Warrior' livery **Below:** The special Eurofighter undergoes refuelling with a Luftwaffe A310 MRTT (Multi-Role Tanker Transport)



the foliage is valid for one year, but it can be extended: "Principally we are safe for 200 flight hours, until the next overhaul."

The foil for a single Eurofighter weighs between 60-80kg and covers a total surface area of about 200 square metres. The type of foil used is prescribed by one of the Eurofighter's manufacturers, Airbus. Also, the System Support Centre – a joint venture between Airbus and the Luftwaffe – shares information so it can check if the weight of the foils has any influence on the handling of the aircraft. "Usually that's not the case, as the foils are spread over the aircraft quite evenly," said Koeplin.

According to Bernd Schwedes from Swiss design company Nordlicht, which in co-operation with digital printers Printzentrum Rostock was responsible for the foliating work, the entire procedure lasted 200 working hours. "I had always wanted to foliate an aircraft," said Schwedes, laughing, "but basically it is nothing different from foliating a truck."

The fighter's first official appearance with the 'Carbon Warrior' livery – on the ground, at least – came during a change of the wing's command on September 23, 2019. □

The canopy rails sport the name of 73 Tactical Air Force Wing's new commanding officer, Col Joachim 'Joe' Kaschke



The technical clearance for the Eurofighter's foliation is valid for one year, but it can be extended

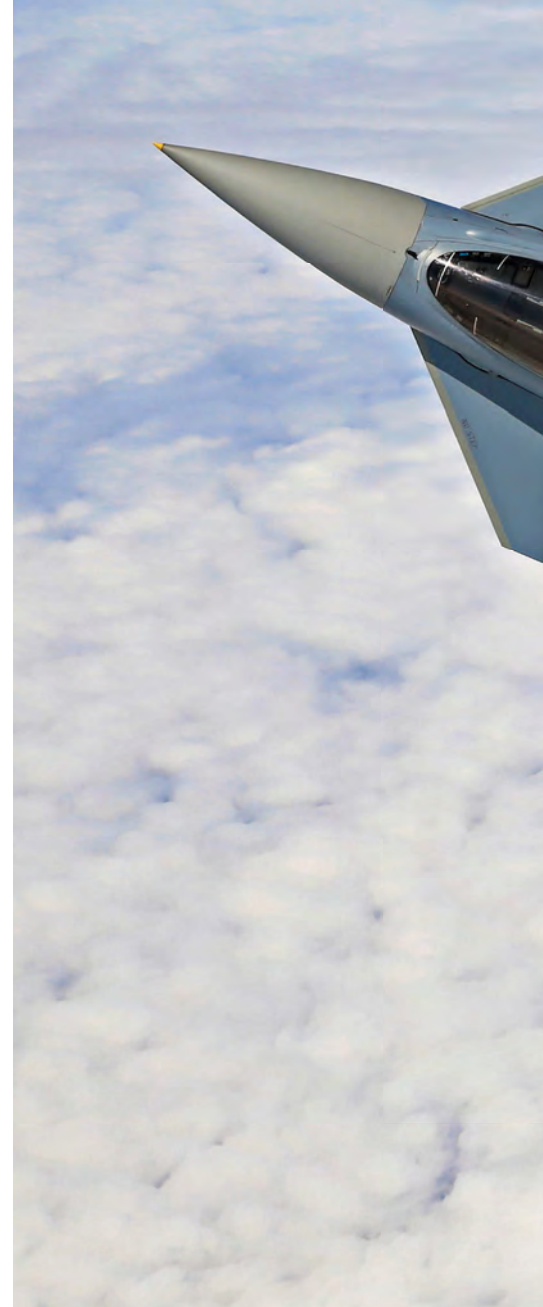


The 'Carbon Warrior' Eurofighter flies over the Northern German town of Neustrelitz





Above: Bernd Schwedes (centre) is assisted by two colleagues while he applies a large piece of foil on the Eurofighter's aft fuselage Below: 73 Tactical Air Force Wing's Master Sergeant Thomas Koeplin and Bernd Schwedes from Swiss design company Nordlicht work on the fin of the Eurofighter 31+18



The freshly finished 'Carbon Warrior' Eurofighter is rolled out of the hangar



The fighter was due to appear in this year's German Armed Forces Day, but the event was cancelled due to the coronavirus pandemic

Planned as a surprise, the out-going commanding officer of 73 Tactical Air Force Wing, Col Gero von Fritschen, saw the newly painted fighter decorated with his name on the canopy rail. He had returned from duty in Jordan only the week before and was unaware of the livery project.

The wing is justly proud of the Eurofighter's 'Carbon Warrior' design. For all crew members, it symbolised a work-intensive period, from the introduction of a new weapons system with all its problems (which they alone had to solve) to the consolidation of flight operations and further flying and technical developments.

They had hoped to reveal the jet as a highlight of Germany's Armed Forces Day on June 13 this year, but it never happened. Due to the ongoing coronavirus pandemic, the entire event was cancelled.

However, on June 12, the day before the planned parade, the 'Carbon Warrior' took off for a training mission with photographers to record some air-to-air pictures as memories. By that time, the fighter had undergone a subtle but important change: the canopy rails now sported the name of the wing's new commanding officer, Col Joachim 'Joe' Kaschke, who piloted the 'Carbon Warrior' aircraft on its inaugural flight. **AFM**



Jacked up, the 31+18 stands in the hangar for its foliage

The AW101 is considered an excellent performer that can meet future battlefield, amphibious maritime, SAR and utility requirements
All images by Ian Harding



During a recent visit to Leonardo Helicopters' manufacturing facility at Yeovil, in Somerset, AFM was greeted by the sight of two Royal Norwegian Air Force Search and Rescue (SAR) AW101 Mark 612s in the circuit, a third being prepared for flight, plus a black Italian Air Force Combat Search and Rescue (CSAR) HH-101A (AW101 derivative) destined for front-line personnel recovery and special-forces duties.

The distinct roles of these two variants reflect the flexibility inherent in the current platform, and bear testament to its manufacturing development and design strengths. Which may also explain why it is known as the Merlin by many operators.

In late 2013, Norway selected the AW101 to fulfil its demanding long-range SAR requirements; providing further support for the

medium-lift helicopter that many observers consider 'best in class'.

Developed jointly by Westland Helicopters in the UK and Agusta in Italy during the 1980s, in response to both nations' requirements for a modern, medium-lift naval utility helicopter to replace their Sea King rotorcraft, the investment in design and development in the platform is now paying dividends.

Design and upgrade

Thirty years on from EH101's first flight on October 8, 1987, with chief test-pilot Trevor Egginton at the controls, and with more than 450,000 operational flight hours, the latest generation AW101 is fulfilling its potential.

The joint venture formed to design and develop the EH101 was named European Helicopter Industries Limited (EHI).

The helicopter was marketed as the EH101 until 2005, when it was re-designated AW101 following the merger between Westland Helicopters and Agusta (forming AgustaWestland).

Twelve years after its inaugural flight, the first 'Merlin' HAS Mark 1 was delivered to the Royal Navy, from what was then GKN Westland Helicopters EH101 manufacturing facility at Yeovil.

Past production has taken place at Verigate, Italy, and continues under licence with Kawasaki Heavy Industries in Japan.

Designed to perform a range of military, maritime and civilian roles, the 'international' AW101 features more powerful engines, advanced main rotor blade technology, a new tail rotor, a glass cockpit and open

architecture (changes have extended well beyond just the instrument displays) and mission systems. The helicopter's design and development, coupled with the very latest technological upgrades, provide the most recent AW101 variant with almost unrivalled multi-role capability in its class.

Tried and tested in the most demanding operational environments, the AW101 is considered an accomplished performer with the operational experience, 'maturity', mission systems and versatility necessary to ensure it can meet customers' future battlefield, amphibious

Merlin

the magnificent

*The Leonardo AW101 is a truly outstanding helicopter with an exceptional track record. **Ian Harding** explains why the 'Merlin' will continue to cast a spell into the future*

maritime, SAR and utility requirements. Surveying the aircraft at close quarters, it is hard to imagine the original design teams could have foreseen the scale of potential, performance and mission effectiveness evident in the latest customer orders. These include Italy (personnel recovery and Special Forces), Norway (SAR), several 'undisclosed' VIP customers, and the UK (maritime anti-submarine warfare/anti-surface warfare and commando/utility).

In terms of significant

evolutionary turning points for the direction of the AW101, senior personnel at Leonardo Helicopters highlight the period around 2005 when AgustaWestland (as it was then) and Lockheed Martin were selected as winners of the US 'VXX' programme to replace the United States' Marine One presidential helicopter fleet with a variant of the AW101 (designated VH-71 Kestrel).

Challenge and change

Although the programme was eventually cancelled in 2009 due to increasing costs, the challenge it had created, and the resultant

technical developments, essentially changed the baseline specification for the AW101.

The 'VXX' programme had been lost, but the investment in it had not been wasted. Future benefits came in the form of direction, greater international interest, more sales and a next-generation AW101 with a profile extending out to 30-40 years.

From this time onwards, the primary areas of AW101 investment were twofold: to update capability, certification and qualification standards; and to upgrade and advance the aircraft's technology.

AgustaWestland personnel,

who were central to the AW101 programme, confirm that the main changes from EH to AW101 were in the lift frames, to ensure compliance with the latest European Aviation Safety Agency (EASA) crashworthiness requirements.

Within that process, the aircraft's 'all-up' weight was expanded from 14,600kg when it entered service (1999) to its current baseline of 15,600kg (2019).

The aircraft has also been tested at significantly heavier weights beyond 16,500kg, with scope for more. This potential can be unleashed in response to ▢



The MK516 of the Portuguese Air Force's 751 Squadron, based at Montijo in Portugal

customers' specific future needs.

To fully exploit the inherent capabilities of the rotor system and enhance the aircraft's hot and high performance, a more capable engine was also needed.

Throughout the 1980s and 1990s, AgustaWestland had the Rolls-Royce Turbomeca RTM322 engine (used by Denmark, Portugal, Japan and the UK) and the General Electric CT7-6 (used by Canada and Italy). The company now uses GE's latest evolution CT7-8E, which lifts engine propulsion from 2,000 to 2,500 shaft horsepower. This engine has further growth potential should customers require it.

Family of systems

Core avionics also represented a major change in terms of processing power and advanced technologies. In this respect, the AW101 and other AgustaWestland designated helicopters benefitted from developments undertaken elsewhere within the company's range (described as a 'family' concept).

Spotlight: Norwegian AW101 SAR Helicopter

The Norwegian Ministry of Justice and Public Security announced on December 19, 2013, that it had awarded AgustaWestland a contract for 16 AW101 helicopters, plus support and training, valued at approximately £1bn, to meet the Norwegian All-Weather SAR Helicopter (NAWSARH) requirement. The contract also includes an option for six further aircraft.

The AW101 will replace Norway's Sea King MK43B helicopters, which have served for over 40 years.

Aircraft deliveries to the Royal Norwegian Air Force began in 2017 and will continue

through to late 2020. Norway's AW101 Mk612 is equipped with an advanced SAR equipment package including a multi-panel AESA surveillance radar system from Selex ES that provides 360° coverage, 4-axis digital Automatic Flight Control System (AFCS), two rescue hoists, searchlight, electro-optical device and a fully integrated avionics and mission system.

Leonardo Helicopters will provide a 15-year after-sales solution comprising support and training, including spares, at each of its six main operating bases as well as aircrew training.

The MK 612 RNoAF undertaking an 'under slung' load test at Yeovil, UK. This aircraft was the test and development aircraft for the Norwegian contract



The ZH851 Merlin HM1 during a confined area landing in 2012, prior to its HM2 update



The Canadian CH-149 Cormorant will be subject to the Cormorant Mid-Life Upgrade, agreed in September 2019



For example, the 101's cockpit design is the same as that found on the AW169 and AW189, except the AW101 has five display panels, the AW169 three and the AW189 four. Sharing this design means the AW101 now has a new 'Core Aircraft Management System' at its heart, managing everything from individual switches and mission sensors to navigation and communications sub-systems.

Sharing technology makes sense and also helps Leonardo Helicopters manage value for money for its customers.

For example, the 'Synthetic Vision' System (SVS) that will be utilised by Norway is a good example of an avionics change developed elsewhere within the AgustaWestland 'family' concept

– it enhances the AW101 pilot's situational awareness (SA), especially when flying in extreme weather conditions.

It is clear AgustaWestland's historic design, technological development, operational expertise and experience have played vital roles in the aircraft's longevity. Considering all factors, perhaps the single most important reason why the AW101 has such an impressive and diverse operational range is its relatively 'simple' baseline structure/specification.

In essence, size matters.

Merlin's multi-role

Following initial contract orders from the UK and Italian armed forces, the burning question was whether the AW101's full potential

would be realised. The AW101 has 'multi-role' billing, which is supported by the proven diversity of the roles it performs over land and sea, under hot and high conditions and in very cold, hostile environments.

Current headline speciality roles include military utility; specialised maritime (anti-submarine warfare/ anti-surface warfare – ASW/ASuW, airborne mine countermeasures – AMCM, patrol and interdiction); CSAR; SAR; personnel recovery; and VIP.

In the UK, looming large on the horizon for the Royal Navy's HM2 fleet are the installation of airborne surveillance and command (ASaC), airborne early warning (AEW), and command and control (C2) through the 'Crowsnest' ▶

Tactical benefits

- Open-architecture system supports various specialised roles.
- Extensive integrated communications suite with secure speech, wireless connectivity that links flight and rear crew to help improve crew communications.
- Exceptional 'field-of-view' from designated visual locations, with full NVG search compatibility.
- High integrity tactical mission systems and adaptive rear console design to support specialised mission systems, such as ASW/ASuW, CSAR and SAR.
- An integrated synthetic vision system that effectively brings a picture of the outside environment inside the helicopter to enhance flight transponder tracking.
- Automatic Dependent Surveillance Broadcast system (ADS-B), which measures the range and bearing of an aircraft from ground-based antennae.
- Helicopter Terrain and Warning System (HTAWS), Traffic Collision Avoidance System II (TCAS), Obstacle Warning System (OWS), Obstacle Proximity LiDAR System (OPLS) and Automatic Identification System (AIS) TX/RX tracking capability.
- Digital mapping, including elevation data above and below the aircraft.
- Crew searchlights as required.
- Dual electric hoist and fast roping.



Merlin avionics

- Flat-panel, multi-function cockpit display based on five 10x8in displays which are NVG compatible.
- Four-axis, digital-Automatic Flight Control System (d-AFCS) with 4D Navigation, plus Instrument Flight Rules (IFR) and Navigation AFCS Modes.
- Latest generation flat-panel Leonardo Airborne & Space Systems 360° AESA radar, with various Electro-Optical/Infra-red (EO/IR) radar systems, weather radar, Electro-Optical Sensor System (EOSS), and other search signal detection systems.
- High Integrity Navigation suite, embedded GPS, integrated radar/navigation, and Attitude and Heading Reference System (AHRS).
- Comprehensive, integrated Health and Usage Monitoring System (HUMS). This provides real-time monitoring of flight-critical systems, plus warnings of potential technical failures before they become critical.
- New Avionics Full Duplex Ethernet (AFDX) Aircraft Data Network for safety-critical applications.
- Upgraded data-link capability (Link 11/Link 16 growth potential), and fully integrated Defensive Aids Suite (DAS).

A rare sighting of one of the two AW101 aircraft delivered to Saudi Arabia during 2013-14



programme (an improved version of the Thales UK Searchwater radar and Cerberus mission system) as part of the UK's carrier strike and maritime task groups (CSG/MTG) operations.

Secondary to these are a whole host of roles including vertical replenishment (VERTREP), casualty evacuation (CASEVAC), under-slung lift (USL) operations, counter-piracy, fisheries protection, humanitarian relief, amphibious and logistics support.

If required, the AW101 has air-to-air refuelling (AAR) capability that will be utilised by the Italian Air Force HH-101As and potentially by the UK Command Helicopter

Force's new Merlin HC4s, as they support the carrier force providing joint personnel recovery and deployed SAR.

The AW101, therefore, has proven it can fulfil most rotary roles and, from the customers' perspective, the aircraft is supported by a modular internal constitution that enables them to choose the systems they require.

Selling points

However, there are a few limitations: the Merlin cannot lift the heaviest loads or match the firepower and agile flight envelopes of some other types; that said, few global helicopters can equal the

depth and quality of the AW101's overall flexibility.

The AW101 is a highly-capable, specialist all-rounder. Aside from the many features that make the aircraft 'tick' inside, the key to its success is down to the quality of Leonardo Helicopters' people, its basic design architecture, including leading rotor blade technology (BERP III/IV-'British Experimental Rotor Programme'), its overall medium size and its cabin size – which is the largest in its class.

The internal cabin space available is a critical and important selling point. Comparing it with the Sea King, which it replaced,



An AW101 photographed at Elstead, UK, during the filming of the James Bond movie 'Skyfall'

the AW101 has greater volume (29m³ vs 28m³), floor area (15.3m² vs 13.94m²) and width (2.49m vs 1.98m) than the Sea King, which is longer and slightly taller. The AW101's large rear cabin supports high-density troop carrying (up to 38 personnel) and emergency passenger evacuations (up to 54 people), which countries like Canada, Norway and Portugal prepare for. Its larger cabin door enhances crew visibility and enables more rapid passenger and aircrew ingress and egress.

This comes into its own, for example, during a stretcher rescue as there is more room to transition the stretcher sideways from either of the AW101's two hoists – one fixed, one deployable. Stretcher and passenger capacity are significantly greater for the AW101 which will prove vital when all available internal space must be utilised.

Ticks the boxes

Despite this size advantage, the AW101's overall 'footprint' is not a great deal larger than that of the Sea King it is replacing. The location of its undercarriage coupled with its folding rotor capability means it can actually fit in to the same space as a Sea King. The main rotor blade diameter at 18.60m (18.90m for a Sea King) is also slightly smaller.

Should the aircraft be required for any of its secondary roles, modularised rear consoles can be divided or removed, enabling the cabin to be re-configured quickly,



The RAF's Merlin HC3A participating in pre-Afghanistan training on the Salisbury Plain Training Area, UK, in 2012

depending on the new role it's expected to perform.

This feature played an important part in Norway's final decision to select the AW101 to meet its future SAR requirements. While most SAR missions may involve small numbers, Norway plans for exceptional SAR events involving large personnel numbers and the carriage of additional specialist

equipment, for example, fire fighters and their equipment.

The AW101 ticks all the right boxes in terms of cruising speed (a maximum 150kts/278km/h); power (in three-engine configuration, with superior one-engine inoperative [OEI] performance) and maximum power gross weight (currently at 15,600kg, but the aircraft has achieved weights

significantly above this). It also has superior long-range performance (exceeding 750 nautical miles/1,300km in standard configuration, though it has also demonstrated 900 nautical miles/1,450km with auxiliary fuel tanks).

Inside, the AW101 presents an impressive array of evolutionary features including a state-of-the-art glass cockpit, improved 'modularised' rear aircrew consoles (evident in the UK's HM2 and Norway's Mk612 variant) and the very latest in tactical mission systems design, as seen in the HM2 and HH-101A variants.

Spotlight: Italian Air Force HH-101A

The first of 15 Italian Air Force AW101 MK 611 helicopters (designated HH-101A 'Caesar') completed its maiden flight at Yeovil in the UK, on March 19, 2014, and the first aircraft was delivered during late 2014.

The HH-101A is configured for Personnel Recovery and Special Forces missions, although it will also support SAR, MEDEVAC and Slow Mover Intercept operations. It operates with the 15th Stormo 'Stefano

Cagna', based at Cervia/San Giorgio Air Base in northern Italy.

The aircraft's range of features include three M134 7.62mm Gatling-type machine guns mounted on the right and left sides of the rear ramp.

Personal recovery and Combat Search and Rescue (CSAR) needs are met by armoured cockpit seats, ballistic protection for machine gun operators, an integrated

electronic warfare system offering self-protection against radar, laser and infrared threats – and note the nose-mounted Electro-Optical/Infrared (EO/IR) system.

The helicopter is designed to carry a combination of up to five crew plus 20 fully-equipped troops, or six crew in addition to eight troops for special ops, ensuring maximum flexibility. It will also feature an air-to-air-refuelling kit for extended range.



The HH-101A of the the Italian Air Force's 15th Stormo 'Stefano Cagna' photographed over the Netherlands during an EU personnel recovery training exercise

A world apart

Incorporating modern open-architecture systems is proving a key component in the AW101 evolutionary story. 'Open architecture' is a rather trendy term, but it describes the AW101's internal flexibility perfectly. This can make selection easier and more cost effective, when additional-role equipment, such as enhanced EO/IR (electro-optical/infrared) sensors are added, as required.

The internal systems available in the HM2, for example, are a world apart from those presented in the HM1. The aircraft's exterior may not have changed materially but

This AW101 MK646 was one of the former Indian Air Force aircraft delivered to the Indonesian Air Force in 2017



inside it is a new aircraft. With the latest tactical systems and hardware available to them, HM2 rear-crew have the capability to operate independently, process information at substantially greater speeds, disseminate this information more quickly, and present it in a more user-friendly fashion via datalinks (Link 11/Link 16 growth in the future).

Central to these key changes are vastly-improved Human Machine Interface (HMI), touch-screen unit (TSU) displays, as well as significant improvements in the radar and sonar systems.

The AW101's modular system design enables customers to select which specific facilities they

require from a menu. Customers can also choose a crew training, maintenance and support package, which can be tailored to specific requirements. Like other manufacturers, Leonardo Helicopters has invested heavily in these areas to ensure the transition process to the AW101 is a smooth one.

Pick and Mix

The competitive tendering stage is brutal, but internal procedures simplify this process, making it relatively straightforward for a customer to match system requirements with specific needs contained in Leonardo Helicopters' 'Concept of Operations'.

Decisions reached will ultimately be based on cost/benefit analysis, but, in some respects, customers now have an aviation 'pick and mix'.

The EH101/AW101 final assembly line is located at Yeovil, although a similar production line was once used at Vergiate in Italy. Kawasaki has also undertaken assembly of EH101s for the Japanese Maritime Self Defence Force.

Over 220 AW101s have been sold, with over 170 aircraft/kits delivered to date. Further Expressions of Interest have been received from Europe and Asia. In addition, Westland Helicopters and Agusta manufactured nine prototype development aircraft (PP1-PP9) and a Civil Certification

airframe known as the CIV01. Of all the AW101 adaptations, the most bespoke is that demanded by the VIP market. However, there is little to differentiate the external appearance of a VVIP AW101 from another variant, save the paint scheme.

Naturally, security surrounding individual VIP aircraft at Yeovil is high, and for good reason. Walking around one example, cordoned off within the flight shed, AFM noticed a few clear differences in the basic design. Fundamentally, it is the same aircraft, but it has a side door that can be electrically or manually operated and no rear ramp.

The large regular cabin door

Three Commando Merlin HC4s captured in flight following their deployment aboard the carrier HMS 'Queen Elizabeth'





Merlin HM2 of 824 NAS completing a cross-country NAVEX

on the right side of the aircraft has also been replaced by a fixed window and an escape hatch. Gaining access to the aircraft (which *AFM* was not allowed to do), a VIP is unlikely to enter and turn left into the cockpit. The likelihood is they will only ever turn right into the cabin, which is their luxury domain.

Flexible layout

The VIP cabin area is typically two or three metres long and contains two or three windows on each side. It can be partitioned off for privacy, making it feel more like an airliner. Depending on requirements, the forward cabin will generally contain up to four VIP seats, while there's

a maximum of 12 passenger seats in the separate rear cabin areas – room enough for a flight attendant, security and VIP guests.

Removing the rear ramp has enabled the space to be 'reclaimed' and used as a stowage area, plus a second entrance for access to the rear cabin instead of using the forward entrance, although this layout is flexible.

Company personnel have faced a relatively steep learning curve adjusting to these specific market demands, to ensure the 'trim' is as it should be. For example, a lot of effort goes into reducing internal noise and vibration levels to those similar of a commercial jet. The VIP market certainly requires a

different mindset and approach.

In all other respects externally, the aircraft is very similar to other AW101s. Inside, cockpit design and mission systems are the same. Customers can choose to have ballistic protection, defensive aids suite (DAS), and forward-looking infrared radar (FLIR). Customers are clearly impressed with the AW101 as a VIP vehicle. This adaptation has momentum and could be as good as it gets within the rotary VIP market.

Maturity

The consensus within Leonardo Helicopters is that the AW101 is a 'mature' platform. This means the company knows how far it can

push the existing design. Some areas may already have reached their optimum configuration, but the maker understands the platform's strengths and where it can be adapted to suit emerging customer needs.

After more than 450,000 operational flight hours in some of the world's toughest environments – including Afghanistan – the AW101 has proven itself as a truly outstanding helicopter with a tried and tested track record. Exceptional versatility, coupled with world-class technological expansion, has secured the helicopter's future and will help to ensure it remains ahead of the curve for years to come. *AFM*

One of the new Commando Merlin HC4s assigned to 845 NAS, photographed completing a confined area landing



Explainer: What is OPLS?

Launched at Heli-Expo 2014, the Obstacle Proximity LiDAR System (OPLS) is designed to enhance the safety of helicopters undertaking SAR and emergency medical services (EMS) roles. It aims to help aircrew avoid main and tail rotor strikes during low-speed hovering manoeuvres in confined spaces.

Consisting of three main rotor-head-mounted LiDAR sensors (Laser imaging Detection and Ranging) it generates a 360° radial view, and a dedicated cockpit control panel. It can detect and track short-range obstacles up to 25m away by time-of-flight measurement at different angles. Video and audio indications are provided on the cockpit Multi-Function Displays (MFDs) and through the aircraft's inter-communication system (ICS).

Norway will utilise the OPLS system, and Canada may too, as they are upgrading their aircraft under the CMLU programme.

Blue Win

This summer, the Luftwaffe and Israel Defense Force met in an historic union over German soil.
Patrick Roegies, Ben Gorski and Jurgen van Toor report



Wings 2020



*Left: F-16D Barak from 105 Sqn seconds before touchdown
Ben Gorski*

For the first time in history, Israeli Air Force jets have landed on German soil.

Six F-16C/D Barak multirole fighters were there to take part in joint exercises with Luftwaffe Eurofighters, marking an historic moment for both countries.

The Israeli Air Force delegation, which also included support aircraft, deployed to Nörvenich near Cologne, the home base of Taktisches Luftwaffe Geschwader 31 'Boelcke' between August 17 and 28. In the first week they participated in Exercise Blue Wings 2020, and were then involved in the Multinational Air Group Days (MAGDAYS). The Israel Defense Force and the Luftwaffe have trained together in the past, but always on Israeli territory. One such co-operation was the Israeli-

organised, 2019 Blue Flag at Ovda Air Force Base in the south of Israel, near Eilat.

The build-up to the deployment started on August 6, with the arrival at Nörvenich of two C-130Js, 662 – callsign 'IAF129' and 663 – 'IAF130'. They were followed on August 12 by Hercules KC-130H 545 'IAF131'. The following day C-130J 'IAF132' also landed at the base.

The IAF delegation also included Hatzor Air Force Base's 101 Squadron, which is referred to as 'The First Fighter Squadron', equipped with its F-16C-40 Barak 2020 single-seaters, and 105 'The Scorpion Squadron' flying the F-16D-40 Barak 2020 twin-seaters.

The aircraft from Hatzor flew to Germany on August 17 using radio callsign 'ATOMI 1-6'. They were

Exercise Report

supported by three KC-707 Re'em tankers assigned to 120 Squadron using the radio callsigns 'GIANT 1, 2 and 3'. However, GIANT 2 returned to Israel halfway through the journey.

Also involved were a G550 Nachshon Eitam CAEW (Conformal Airborne Early Warning), radio callsign 'GLORY 1', assigned to 122 Squadron, plus a KC-130H Karnaf, radio callsign 'IAF133' – all based at Nevatim Air Force Base in Israel.

Too good to miss

With a challenging environment due to the spread of COVID-19, this represented the IAF's only international exercise in foreign airspace this year. It was considered too important an opportunity to be missed, giving crews the chance to enhance their skills, maintain readiness in the face of a wide range of challenging scenarios, and continue strengthening bonds with foreign air forces.

"The IAF will participate in the exercise for the first time as Germany's guests," said Lt Col A, Commander of the 105 Squadron, as head of the Israeli Air Force deployment team. "This is an opportunity to showcase our abilities and learn about NATO's flight and training techniques."

The tail of the TLG31 flagship 'The Sword of Boelcke'. In the background is another specially marked Eurofighter, 'Quadrige Tranche 4', departing on full afterburners

Ben Gorski



'The Sword of Boelcke' Eurofighter on final approach, with weapons, fuel tanks, undercarriage and intakes clearly visible

Ben Gorski



During the deployment, the Israeli Air Force conducted two sorties a day. The morning sortie usually comprised six aircraft, with four taking to the air in the afternoon

P Roegies





Two-seater F-16D Barak from 105 Sqn departs Runway 25 from Nörvenich Air Base. Note the large supplementary fuel tank that was fitted for the long flight from Israel
Ben Gorski



KC-707 272 from the Re'em 120 Sqn on short final approach Ben Gorski

The preparations for this deployment started almost a year earlier, when IAF officials visited Germany to discuss the possibilities. "We meet here and remember what happened in the past, and do everything possible to work together in the future," General Norkin said during that visit. Ideally, a German air base in the south would have provided a more convenient temporary base, but Nörvenich, close to Aachen in the west of the country, offered infrastructure advantages.

In the first week of the deployment, the IAF joined in a ceremonial flight, which on August 18 included a 'Memory for the Future' fly-by over the former Dachau concentration camp, led by an Israeli Gulfstream G550 and including F-16 fighters and two German Eurofighters, in memory of Holocaust victims.

During that flight, they also flew over Fürstenfeldbruck Airport, close to Munich, to commemorate the 11 Israeli Olympic team members who were murdered during the 1972 terrorist attack.

The Israeli Air Force Commander, Maj Gen Amikam Norkin, led the fly-by in the Gulfstream G550, alongside the Commander of the German Air Force, Lt Gen Ingo Gerhartz, and the IAF's first female squadron commander, who is in ▶





A C-130J 662 from the 103 'Elephants' Squadron Ben Gorski

charge of 122 'Nachson' Squadron, Lt Col G.

Afterwards, an official memorial ceremony was held at Dachau attended by, amongst others, the German Federal Minister of Defence, Annegret Kramp-Karrenbauer, and the Israeli Ambassador to Germany, Jeremy Issacharoff. The deputy commander of 109 Squadron spoke at the ceremony – being a grandson of a Holocaust survivor who was imprisoned at that camp the event held special significance. A 'Yizkor' reading was also given by Rabbi Mendel Moraity in memory of the victims. The entire ceremony was broadcast live on



'The First Fighter Squadron' was founded on May 20, 1948. These days it operates the F-16C Block 40 Barak from its home base at Hatzor P Roegies

several Israeli digital platforms.

While strategically important, the deployment was also very valuable in strengthening Israeli-German co-operation. The IAF conducts, and will continue to

conduct, joint exercises with other air forces to maintain its fitness for purpose and readiness, as well as to advance relations and build co-operation between forces. On a tactical level, the Israelis

appreciate the opportunity to learn from other air forces and train in unfamiliar territory, sometimes under challenging conditions. They see this as a vital step in the continuous improvement of their pilots' knowledge and experience.

Israel's Blue Flag biennial exercise is a good example of this, providing the chance to train with several different foreign air forces, with a view to enhancing capabilities across the board.

The Luftwaffe conducted the aerial training under NATO's 'Framework Nations Concept', aimed at standing up fully-trained and interoperable multinational task forces among allies and NATO partners.

Introduced by Germany in 2013, the initiative is intended to support the formation of larger groups of forces to improve the level ▢

A KC-130H Karnaf 545/4X-FBZ from 131 Sqn. The exercise was supported by the two Hercules squadrons based at Nevatim Air Force Base. This KC-130H touched down at Nörvenich just before the Israeli F-16 aircraft arrived. It departed back to Israel later that afternoon Ben Gorski





The KC-707 carried out an initial approach on the arrival day. Here it is turning on to short finals for Runway 25 Ben Gorski



Israel Defense Force Gulfstream V SIGINT from 122 Squadron Ben Gorski



A Eurofighter operated by TLG31 returns from its mission Ben Gorski



An F-16C Barak from 101 Sqn departs Runway 25 from Nörvenich Air Base for a morning mission Ben Gorski



G550 Nachshon Eilam from 122 Sqn lines up for Runway 25 Ben Gorski

of combat readiness within the alliance, ensuring that military flying assets are interoperable, well trained and fully operational.

The aim is to achieve an initial operational capability by 2023, and reach full operational capability in 2026. Each associated event typically consists of two rehearsal days and two live-flying days.

According to Lt Gen Ingo Gerhartz, the Chief of the German Air Force, the Multinational Air Group exercise days represent an excellent example of multinationalism at work, allowing the Luftwaffe to operate 'shoulder-to-shoulder' with European allies and partners in preparation for combined missions.

MAGDAY events are usually scheduled each quarter during the year, and Germany hosts them as the Framework Nation for the project. However, due to the impact of the coronavirus pandemic, there has been a significant reduction in the frequency of the exercises, which has been limited to two events in 2020. The previous MAGDAY took place in June, with participants from the Czech Republic, France, Germany, Poland and Slovakia.

Israel – a NATO partner country under the Mediterranean Dialogue programme – participated in the

There's showing off, and then there's full-afterburner antics! The Germans gave the Eurofighter a good work-out for the enjoyment of their Israeli guests Ben Gorski



Israel Defense Force F-16s taxiing to the active Runway 25, ready for the day's exercise Ben Gorski



Multinational Air Group exercise during the second week of the deployment to Germany between August 24 and 28, including some night-time missions.

Fighter jets and tanker aircraft from Germany and Israel practised aerial drills in a multinational setting, along with Czech and Hungarian Gripens, making this a truly combined air operation. The Hungarian Gripens were temporarily deployed at Jagel Air Force Base in Germany for the duration of the exercise.

The main focus of this MAGDAY, concluded on August 27, 2020, with missions to practise air superiority against fictitious opponents and ground-based air-defence systems.

Another particular highlight of the event was the participation of Israeli F-16 fighters and a Boeing 707 with refuelling capabilities.

Israel has maintained close links with the alliance for more than 20 years and there are hopes these can be strengthened. In early September 2019, NATO's Assistant Secretary General for Defence Investment, Camille Grand, concluded a two-day

Bluewings 2020 participants

Squadron	Name	Type
101 Squadron	The First Fighter Squadron	F-16C-40 Barak 2020
103 Squadron	The Elephants Squadron	C-130J
105 Squadron	The Scorpion Squadron	F-16D-40 Barak 2020
120 Squadron	The International Squadron	KC-707 Re'em
122 Squadron G-V Nachshon Shavit	The Nachshon Squadron	G550 Nachshon Aitam
131 Squadron	The Yellow Bird Squadron	C-130E Karnaf C-130H Karnaf. KC-130H Karnaf
TLG31	Boelcke	EF2000 EF2000T

visit to the country after meeting with senior representatives of Israel's ministries of defence

and foreign affairs. Discussions covered enhancing the alliance's co-operation with the Israel

Defense Forces in the Eastern Mediterranean.

Additional topics, including weapons proliferation and arms control, cyber defence and research and development were also covered. In other meetings with civilian and military officials, the Assistant Secretary General discussed civil preparedness and air defence.

In the end, this successful summer 2020 deployment to Germany was a major step forward in increasing co-operation between NATO and Israel. **AFM**



An F-16D two-seater, from 105 Squadron. On August 20, 1950 an operational training body was founded within 'The First Fighter Squadron'. It expanded and earned the 'Scorpion' nickname P Roegies

Russian

A long-delayed revolution

Alexander Mladenov investigates Russia's slow progress in developing its advanced unmanned aerial systems (UAS), including those for strike missions

Right: The latest Sukhoi S-70 Okhotnik (Hunter) UAS is a single-engined stealth design without any tail fins Ryan Dorling

The Russian military was a relatively late adopter of unmanned aerial systems (UAS) equipped with modern day/night sensor payloads for intelligence, surveillance and reconnaissance (ISR), and it has been seriously lagging behind in the unmanned combat aerial vehicle (UCAV) arena, too.

But, in recent years, it has been working hard to bridge the huge gap between its own UASs and those found, not only in the Western world and Israel, but also in China, Turkey and Iran. Russia tested its first unmanned system endowed with surface-strike capabilities in the real-world combat scenario in Syria in 2019.

The Russian military has a growing expectation to expand its UAS force, used for ISR duties. So far, it is fielding a large and diverse fleet of locally-produced small UASs, complemented by a sole medium-sized type imported from Israel, which has been active in all military campaigns since 2014.

The Russian Navy has been leading the way in the use of long-endurance tactical UASs (TUASs) for various ISR applications. It operates a UAS-equipped regiment, in addition

to half a dozen squadrons and detachments assigned across all four major fleets. These are equipped with the Forpost and Orlan-10 systems, with the first of these fielded in 2013. In addition, the Russian Aerospace Forces (VKS) had one unit equipped with the Forpost TUAS (two systems), stationed at Budennovsk in the southern military district, not far away from the troubled North Caucasus region.

In 2015, the VKS got its second TUAS unit, assigned to the 999th Air Base at Kant airfield in the former Soviet republic of Tajikistan, also boasting the Forpost and Orlan-10 systems.

Two more Forpost systems are operated by the Russian MoD's (Ministry of Defence) 924th State UAS Training Centre in the city of Kolomna, southeast of Moscow.

According to the Russian defence minister, Sergey Shoigu, the Russian MoD's diverse UAS fleet logged a total of 16,000 sorties in the war campaign in Syria between September 2015 and January 2018, with a total flight time of 96,000 hours. The UASs employment for a wide variety of ISR applications in Syria enabled the effective use of the VKS strike aviation assets, as well as artillery and rocket systems against anti-Assad forces

countrywide. By September 2018, the number of Russian UAS sorties undertaken in the Syrian war exceeded 25,000, while the total flying time hit 140,000 hours.

Forpost for Russian military

Currently, the Russian military has only one unmanned aerial system in regular service: it comes at the tactical end of the spectrum, boasts sufficient range and endurance, and is outfitted with a high-performance multi-sensor, electro-optic/infrared (EO/IR) payload for round-the-clock operations. It is the Forpost (Outpost), a Russian-assembled version of the 1990s-vintage, Israeli-made IAI Searcher Mk II. Assembled at the Urals Civil Aviation Works (UZGA) company in Yekaterinburg, the Forpost is used by the recce units of the VKS, Russian Naval Aviation and Land Forces.

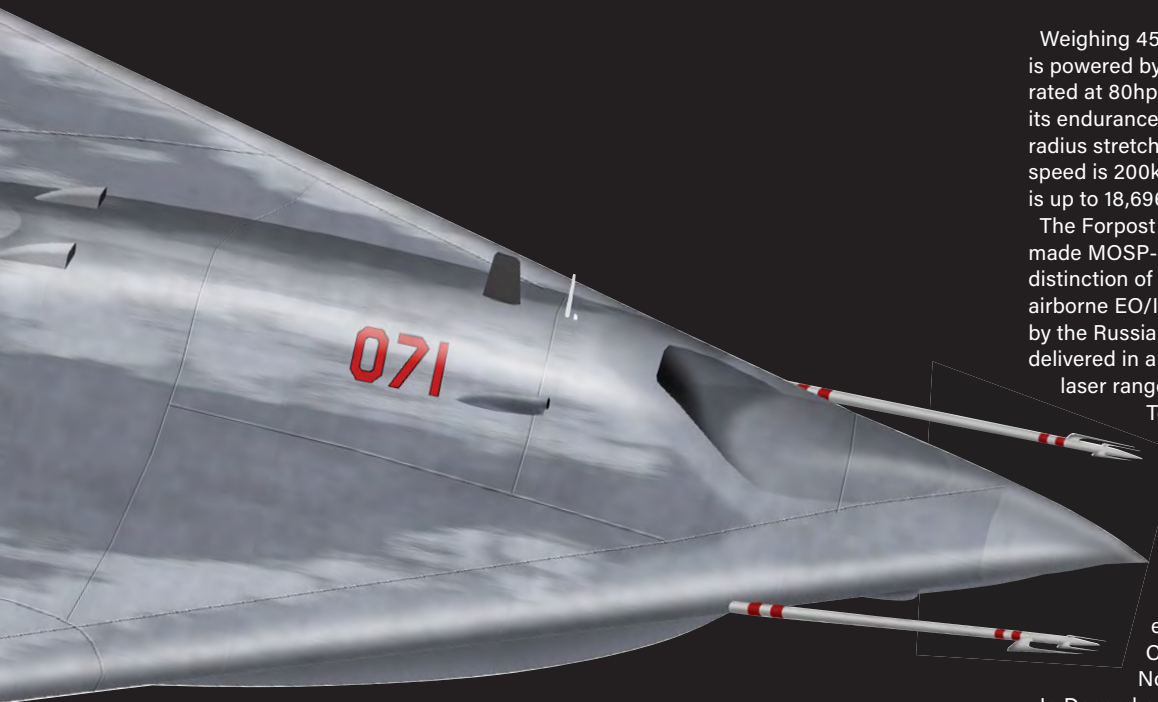
Known as the most-advanced UAS in regular service by the Russian military, it is set to remain in widespread use for at least ten years, as the Forpost has performed superbly in Syria.

The Forpost UASs assembled at UZGA arrive as IAI-supplied, knocked-down component kits, part of a contract dating from 2011. This required delivery of ten systems at a total price of nine billion roubles (equating to about US\$300m at the time).

UAS



Above: The Forpost is a licensed version of the IAI Searcher II with a payload of up to 100kg, maximum take-off weight of 456kg, operational radius of 250km and a service ceiling of 18,696ft Russian MoD



Weighing 456kg, the Forpost/Searcher Mk II is powered by an internal combustion engine rated at 80hp. Its payload is up to 100kg and its endurance extends to 18 hours. Operational radius stretches to 250km (135nm), maximum speed is 200kph (110kt) and operating altitude is up to 18,696ft (5,700m).

The Forpost comes equipped with the Israeli-made MOSP-3000 payload, which has the distinction of being the highest-performance airborne EO/IR system fielded in regular use by the Russian military. However, it has been delivered in a downgraded version, lacking a laser rangefinder and laser designator.

Together with the smaller Orlan-10, the Forpost was in service between 2012 and 2014 in UAS squadrons and with detachments of the VMF (Russian Navy) and VKS. The VMF is the largest Forpost operator, fielding UAS squadrons, equipped with the Forpost and Orlan-10, across its Baltic, Pacific, Northern and Black Sea Fleets.

In December 2016, the Northern Fleet got the first fully-fledged UAS regiment in the Russian military. It was established on the foundations of the existing UAS detachment, which had launched operations in 2013.

Stationed at the newly-refurbished Severomorsk-2 airfield near Murmansk on the Kola Peninsula, the first UAS launch was reported on July 7, 2017. The unit, whose number and organisational structure has not yet been revealed, is equipped with both UAS types.

The regiment is tasked with carrying out surveillance over the Northern Fleet's entire

Each system includes a ground-control station, three air vehicles and the required ground-support equipment.

The first UZGA-assembled Forpost UAS was flight-tested in December 2012 and, in 2013, all the contracted systems were delivered to the Russian military. According to the Russian daily newspaper *Vedomosti*, a follow-on contract for ten more Forpost systems was signed in 2015.

In addition, the Russian military acquired two more IAI-assembled Searcher Mk II systems, for testing and evaluation purposes. These were ordered in April 2009 and the first one was delivered in 2011.

The first Searcher Mk II used by the Russian military was seen at the Shtit Soyuz (Union's Shield) international exercise in Ashuluk, southwestern Russia, in September 2011.



Above: The Forpost operator's station of the Baltic Fleet, displaying the information provided by the MOSP - in this case a combat ship tracked using the thermal imager Russian MoD **Right:** A Forpost UAS of the Baltic Fleet is prepared for a mission at Chkalovsk airfield near Kaliningrad Russian MoD





area of responsibility, including the extensive coastline and important infrastructure in the region. The list of its tasks also includes artillery-fire correction; targeting of ship and ground-launched anti-ship missiles; surveillance of ship and coastal missile and artillery-firing exercises; and forward control of aviation strikes. Ironically, it also undertakes environmental monitoring in Russia's far northwestern regions.

The regiment is also set to play an important role in supporting Russia's ambitious and rapidly developing military and economic expansion strategy in the deep-frozen Arctic.

The UAS regiment of the Northern Fleet, together with the other UAS-equipped units of the Russian military, saw intense use in various deployed operations such as the security of the 2014 Winter Olympic Games in Sochi and the referendum on the Crimean Peninsula in 2014. Since 2015, the unit's personnel and UASs have also reported multiple combat deployments to Syria, in addition to regular contributions to Russian counter-terrorist operations in Dagestan, Northern Caucasus region.

Enhancing systems

The next large-scale order for Forpost systems, this time in a seriously enhanced form, was placed by the Russian MoD in 2018.

According to Yuri Borisov — deputy prime minister of the Russian Federation and former

deputy minister of defence responsible for the procurement of armament systems

— it covered deliveries of the much-improved Forpost-R version, assembled at UZGA from Russian-made components. Speaking to the press in April 2016, Borisov hinted that the Russian MoD had plans for purchasing as many as 30 improved Forpost systems in the next five to ten years. However, at this time Israel is known to have banned the sale of any more advanced UASs to the Russian military.

This move has prompted the Russian MoD to fund the development of an enhanced Forpost derivative, manufactured with locally-supplied materials, systems and mission payloads.

Dubbed Forpost-R (the R denoting Russian), it completed its factory testing in December 2019, while state testing and the initial deliveries to the Russian military were scheduled to begin this year.

Powered by the new Russian-made APD-85 internal-combustion engine, the Forpost-R weighs 500kg. Its practical ceiling is 19,685ft (6,000m) and it can fly for up to 18 hours, uninterrupted. The Russian sensor suite includes a new EO/IR payload for day and night operation. The Schwabe GOES-540 is a high-performance payload, weighing about 30kg. It integrates a cooled, short-wavelength thermal imager, TV camera and a laser rangefinder/target designator, all installed on a common gyro-stabilised platform.

The GOES-4, housed in a 250mm-diameter

turret and weighing 32kg, was developed by the NPP Aviation and Naval Electronics company, and is touted as an alternative payload for the Forpost-R. The detection range of the TV camera against main battle tanks is quoted as 18km (10nm), while the recognition range is claimed to be 8km (4.4nm).

There were hints that this enhanced Forpost derivative will get a Russian-made side-looking radar system, accommodated in an external pod, and it is also rumoured to be fitted with ELINT and SIGINT payloads (electronic and signals intelligence), with a range up to 250km.

It is also expected the Forpost-R will feature a new datalink system enabling it to communicate directly with other aircraft, including attack helicopters, supplying motion video directly to their cockpit. The Mi-28NM is the first VKS helicopter, said to be equipped with a new-generation datalink, enabling it to communicate with UASs.

Orion MALE ready for service

The first medium-altitude, long-endurance (MALE) class UAS, entirely designed and manufactured in Russia, was set for delivery in 2020, ready for experimental operation. Intended for a wide variety of military applications, the Orion has been developed and manufactured by the privately-owned Kronstadt Group of St Petersburg, and it bears a strong external resemblance to the General Atomics MQ-1 Predator.



The first Orion prototype in flight Kronstadt Group



According to the Kronstadt Group, the Orion's test and evaluation programme progressed smoothly. Delivery is expected this year Kronstadt Group

Left: Manufactured by the privately-owned Kronstadt Group of St Petersburg, the Orion MALE-class UAS uses a V-tail air vehicle with 1.2-tonne take-off weight. It can fly for up to 24 hours. Kronstadt Group. **Below:** According to Kronstadt Group's former director general, Armen Isakyan, the export version, dubbed Orion-E, could be offered with strike capabilities. There were hints that the first armament testing campaign was undertaken in 2018, using in-house developed air-to-surface munitions, with an example seen here. Alexander Mladenov



Orion's development was fully funded by the Russian MoD, with the programme, code-named Inokhodets, initiated in 2011.

It was aimed at developing and testing an all-new unmanned aircraft system, optimised for long-endurance ISR missions, a role only partially satisfied by the deployment of the licence-produced Searcher Mk II.

The take-off weight of the V-tail aircraft is around 1,200kg, its wingspan 16m and length 8m. It features a low acoustic signature and fully-automatic flight control, and comes equipped with an anti-icing system and retractable undercarriage. Power is supplied by an Austrian-made turbo-charged Rotax 914 internal-combustion engine, rated at 115shp, which drives a two-blade Russian-made AV-115 propeller. An all-Russian engine for the Orion is currently in development by the Agat company. It's dubbed APD-110/120 and is rated at 110 to 120shp.

The Orion's range is 250km, its ceiling is 24,600ft, maximum speed is 200kmh (110kt) and it can fly for up to 24 hours at a time. Orion's maximum take-off weight is 1,100kg and it can haul a payload up to 200kg.

At this stage, it includes a variety of optronic, SIGINT/ELINT and radar sensors, but no details have been revealed. A scale model was displayed by the Kronstadt Group, that was equipped with a large optronic payload in its nose and radar under its mid-fuselage. SIGINT/ELINT sensors were installed under the tail. ▶



Okhotnik UCAV in early testing



Above: An Okhotnik UCAV and Su-57 prototype demonstrate the manned-unmanned teaming potential of modern UASs. Russian MoD

Russia's first jet-powered unmanned combat air vehicle (UCAV), dubbed Okhotnik (Hunter), is set to enter service with the VKS by 2025 at the earliest. According to Russian deputy prime minister, Yuri Borisov, operation of the sophisticated UCAV system will require exhaustive tests. He said Okhotnik's main testing and evaluation is scheduled for completion in 2023 or 2024, including demonstration of strike missions with different types of weapons.

The jet-powered Sukhoi S-70 Okhotnik UCAV took to the air for the first time on August 3, 2019, from the airfield at the VKS' 929th State Flight Test Centre in Akhtubinsk, southwest Russia. The flight lasted more than 20 minutes, with the Okhotnik climbing to 1,968ft (600m) altitude, while being controlled from the ground.

Developed as a classified programme by jet fighter maker Sukhoi, work on the S-70 Okhotnik began in 2011. It is a low-observable system intended for deep-strike missions, featuring a flying-wing aerodynamic layout without fins.

The UCAV is for use against well-defended ground targets, operating in joint formations with Su-57 fifth-generation fighters, with which the S-70 shares significant design commonality. In late September 2019, Sukhoi demonstrated manned-unmanned teaming operations of the S-70, flying in a mission integrated with a Su-57. The operations took place at the 929th State Flight Test Centre, with the Okhotnik flying in its full avionics configuration, to demonstrate sensor augmentation for the Su-57, a key capability when facing a well-developed air-defence environment.

The T-50-3 prototype of the Su-57 has been actively involved in the Okhotnik development programme, testing the air vehicle's flight-control system and other equipment.

The Okhotnik is being promoted by the Russian MoD as a universal, baseline, unmanned, survivable platform, for deploying advanced air-to-surface weapons, carried in internal bays. In addition, intelligence, surveillance and reconnaissance equipment and other mission payloads will provide the system with additional capabilities.

Powered by what is believed to be a single AL-41F jet engine, the Okhotnik's maximum take-off weight is estimated at 20 to 25 tonnes. It could carry up to 2.8 tonnes of weapons in internal bays, and its maximum speed is expected to be about 1,000km/h (540kt), while its range is up to 5,000km.

The Okhotnik's sole prototype for flight trials was rolled out in June 2018 and the first high-speed taxi trials, accelerating to 110kt (200kph) speed, were reported in November 2018 at the airfield of Sukhoi's NAZ plant in Novosibirsk.

Then, in January 2019, a series of images, taken at the NAZ airfield, surfaced on the Russian internet, showing the Okhotnik's first prototype during taxi testing. Pictured next to a large tractor, it was seen to be bigger than the Su-57 fighter. Later on, satellite photos from Akhtubinsk airfield, the 929th Flight Test Centre home base, showed it side-by-side with the Su-57, indicating that the UCAV has a considerably larger wing span, of around 19m.

The vehicle uses radar-absorbent coatings and, at the MAKS-2019 international aerospace exhibition, Sukhoi displayed an S-70 scale-model, which displayed a flattened exhaust nozzle. This is designed to enhance its stealth performance, especially when scanned by radar, rear-end on. In addition, the flattened engine nozzle offers a welcome reduction in the vehicle's infrared signature.



The Okhotnik UCAV prototype seen taxiing in at VKS' 929th State Flight Test Centre at Akhtubinsk. Russian MoD

Orlan-10 used widely

The Orlan-10 is an affordable and combat-proven UAS system with reasonably-long endurance. It is in widespread use with the Russian military, and in some units it is deployed to complement the Forpost TUAS force. It has inferior sensors, but is much cheaper, enabling it to be purchased in large numbers. As such, the Orlan-10 is much less sensitive to losses, which are known to have often occurred in combat situations.

Produced by St Petersburg-based Special Technology Centre, each Orlan-10 system incorporates one ground-control station with antenna unit, a bungee launch catapult and two to four UASs, which come with rapidly-interchangeable payloads. The list of the primary single-sensor payloads includes separate IR (infrared) and EO (electro-optic) cameras, while the optional payloads include sensors for detection of radiological, chemical and biological contamination, signals intelligence (used for pinpointing the location of tactical radios), weather probe sensors and equipment for monitoring cellular mobile telephone networks and creating jamming signals (used in the Leer-3 EW system). There is also a version, dubbed Orlan-Universal, fitted with a combined EO/IR payload to enable round-the-clock operation.

The Orlan-10 air vehicle has a maximum take-off weight of 18kg, with the payload weight limited to 5kg. Its wingspan is 3.10m and it is powered by a gasoline internal-combustion engine. Orlan-10 has flight endurance of between ten and 16 hours and it can fly at speeds from 70 to 150kph, with a service ceiling of 19,680ft. The ground-control station can receive a live video feed at a range of up to 120km.

The basic Orlan-10 is in widespread military service, operated by numerous UAS units of the Russian Land Forces, airborne troops and navy branches. It is also integrated into the Russian Land Forces' joint tactical control network, and used for a wide variety of intelligence, surveillance and reconnaissance (ISR) applications.

As well as tactical reconnaissance, the baseline Orlan-10, outfitted with interchangeable EO and IR payloads, is widely deployed for artillery long-range fire correction, escort and security patrols. In 2019, it was used for the first time for targeting support of tactical ballistic missiles.

The larger Orlan-30, with its wing span of 3.8m, has a more sophisticated mission suite, including a combined EO/IR payload weighing up to 10kg, with a laser rangefinder/designator for artillery fire correction and target designation. It can also have SIGINT sensors. Its launch weight, at 27kg, is twice that of its predecessor, while its cruise speed is 150kmh.

Uninterrupted flight time is up to five hours.



The Orlan-10 is a small unmanned system with catapult launch and parachute recovery, offered for tactical reconnaissance purposes. The maximum take-off weight of the air vehicle is 14kg, and it will fly for up to ten hours Russian MoD



The main EO/IR payload is the MOES, developed by the Moscow-based NPK SPP company. This system is 410mm in diameter and weighs 56kg. It houses two thermal imagers in addition to a TV camera and a laser rangefinder/designator.

Experimental operation

Each Orion unmanned aerial system comprises between three and six air vehicles, together with a ground-control station housed in a transportable shelter, an automatic take-off/landing system and ground technical support facilities.

The initial flight test programme, launched in 2016, was undertaken at Zhukovsky airfield southeast of Moscow, with the maiden flight made in May or June.

Production of the Orion prototypes has been undertaken at a newly-constructed manufacturing facility at Protasovo airfield near the city of Ryazan; it is also set to deal with series production for the Russian military and export customers.

According to the Russian deputy minister of defence, responsible for the procurement, Alexey Krivoruchko, speaking to the press in June 2019, the Orion's flight testing was in the final stages.

The first deliveries of production-standard systems were scheduled for the year-end.

In August 2019, Kronstadt Group's general

designer, Nikolay Dolzhenkov, also hinted that the Russian MoD could get its first Orion UAS for experimental operation by the year-end. He added that on authorisation of the full-rate production by the Russian MoD, the company's production line will be able to roll out up to seven systems a year.

In addition to the ISR applications, the Orion is also being offered for strike missions, and the Kronstadt Group demonstrated its small guided munitions, exclusively for UASs in 2018.

The Russian MoD confirmed that an Orion prototype has already been combat-tested in Syria, including strike missions.

Korsar TUAS for Land Forces

The Korsar (Corsair) TUAS — tactical unmanned aircraft systems — has undergone state flight testing, and first deliveries to Russian Land Forces for experimental operation were expected earlier this year.

A new-generation TUAS, the Korsar was developed by the Rybinsk-based KB Luch design bureau, a subsidiary of the Russian Electronics holding company, controlled by the Rostec state-owned industrial conglomerate. Its development and testing activities have been fully funded by the Russian MoD.

The Korsar was shown to the public for the first time in May 2018.

The TUAS uses an air vehicle with a high-wing/twin-boom design layout and



A close look at the Orion's MOES EO/IR payload: 410mm in diameter and weighing 56kg, it can accommodate two thermal imagers along with a TV camera and a laser rangefinder/designator Alexander Mladenov



Left: The Korsar is a new-generation, tactical unmanned air system developed for the Russian Land Forces as a platform for a range of ISR battlefield applications Alexander Mladenov
Right: This is the Altius-U prototype, flown for the first time in August 2019 Russian MoD



inverted V-tails. It is powered by a pusher internal combustion engine rated at 50hp, driving a two-blade propeller. Take-off and landing take place on a conventional runway.

The unmanned air system consists of one ground-control station and several UASs. In the initial production-standard version, the air vehicles are equipped only with an EO/IR payload for ISR missions and the targeting of guided weapons.

The vehicle's wingspan is 6.5m, its length is 4.2m and it has a maximum take-off weight of 200kg. Korsar has a maximum flight endurance time of up to eight hours, a top speed of 180kmh (99kt) and a cruise speed of 120kmh (65kt). Its practical ceiling is 19,680ft and its datalink range extends to 120km (65nm).

Expanding capabilities

The Korsar's performance makes it suitable to complement the Orlan-10 systems currently in widespread operation by the Russian Land Forces, or to possibly replace it at a later stage.

According to sources from Russian Electronics, works are in progress to enhance the Korsar's mission capabilities by extending the datalink range to 250km (135nm) and by integrating additional payloads weighing up to 30kg.

This could result in an expanded range of military applications, for example electronic warfare.

According to Oleg Yevtushenko, executive director at Rostec, the avionics suite of the Korsar enables its easy integration into the new net-centric warfare concept of the Russian Land Forces.

The Korsar has also been cleared for export in a modified derivative with a mission radius reduced to 100km.

Altius HALE for Russian Navy

In January 2019, Russian MoD's Alexey Krivoruchko revealed details about an advanced UAS design developed for the Russian military. The Altius is in the high-altitude, long-endurance (HALE) class and has serious potential for undertaking strike missions.

Powered by two diesel engines, each rated at 250shp, this air vehicle has a take-off weight of about 5,000kg and wing span of 28.5m. Its flight endurance is 48 hours, its range extends to 10,000km and its ceiling altitude is 39,360ft (12,000m). A datalink suite including SATCOM enables ultra-long-range operations.

The Altius UAS was originally designed by the Kazan-based Simonov Design Bureau, in co-operation with Kronstadt Group, with its maiden flight reported in July 2016.

One Altius-M and two Altius-O prototypes were built for use in a limited flight-testing campaign, with the programme fully-funded by the Russian MoD.

The Altius-U is a vastly-improved version

with a maximum take-off weight increased to 6,000kg and a combat load of up to 2,000kg, while endurance is claimed to exceed 24 hours.

Since 2018, the Altius' further development, testing and serial production has been undertaken by the UZGA company in Yekaterinburg, reportedly due to Simonov Design Bureau's inability to deal with the overly-complex programme, the first of its kind undertaken in Russia. The Altius-U prototype was most likely produced by reworking one of the existing Altius-O prototypes.

According to the Russian MoD, the Altius-U's first flight, made in August 2019, lasted for 32 minutes, the maximum altitude was 2,624ft (800m), and the air vehicle was airborne in a fully-autonomous mode.

Its mission suite will likely include EO/IR and radar payloads, as well as SIGNINT and ELINT equipment, but no details have been confirmed yet.

There were hints in the Russian press that the main use of the Altius-U will be in the long-range maritime role of patrol and reconnaissance, operated by the VMF, which currently has very limited capabilities, provided by manned aircraft.

The Altius-U is intended to operate with the large Northern and Pacific fleets, and to be mainly used for long-range patrols in Russia's Arctic zone, including missions along the Northern Maritime Route. **AFM**



The Altius-U is set to be used for long-endurance patrols in Russia's Arctic regions, operated by the Russian Naval Aviation Service Russian MoD

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A softer s



This year's Sea Breeze exercise, involving the US and the Ukraine saw plenty of action in the Black Sea. But as **Vladimir Trendafilovski** reports, COVID-19 restrictions were clearly evident

This year saw the 20th iteration of the annual Sea Breeze multinational maritime exercise. Held in July, the bilateral exercise between the Ukraine and the United States took place in the Black Sea.

The main goal of Sea Breeze is to strengthen maritime security and stability in the Black Sea region by improving the co-operation and interoperability between participating nations – including NATO members and various regional partners.

Due to the COVID-19 pandemic, the traditional format of the exercise had to be abandoned and Sea Breeze 2020 was organised in a format conforming to these extraordinary circumstances.

As a result, unlike previous years, its duration was cut in half to only one week. All exercise activities

took place exclusively at sea, with participants strictly adhering to the safety protocols dictated by the 'new normal'.

The exercise ran between July 20-26 and eight nations took part in it – Bulgaria, Georgia, Norway, Romania, Spain, Turkey, the Ukraine and the United States – providing in total 2,000 servicemen, around 20 ships and more than 20 aircraft that operated both in Ukrainian territorial and international waters.

Exercise specifics

Because of the coronavirus, the land component (ground forces element) was completely removed from the exercise; only the at-sea phase remained this year, where both the sea and air components took part.

The high level of interoperability

reached between the participants during earlier iterations allowed for fast transition to the active phase, where all sea and air operations were organised in a so-called 'free play' format – exercise participants being unaware of their tasks in advance, having to act immediately upon orders received in real time from the main operations centre.

This year, the operations centre consisted of two sub-components – the Ukrainian (in Odesa) and the US (in Rota, Spain) – all exchanging information online in real time. This was another novelty introduced due to the pandemic, increasing the level of realism.

As in earlier iterations, the exercise forces trained in peacekeeping operations, but specific details on exercise events remain classified, plus the public

Above: The single VMS Mi-14PS, s/n '34 Yellow' of 10 mabr over the Sea Breeze 2020 exercise fleet, July 24. The ship formation is led by the USN destroyer USS 'Porter' (DDG-78) followed by the Spanish Navy frigate ESPS 'Alvaro de Bazan' (F101) and the Turkish Navy frigate TCG 'Yildirim' (F243)
Boris Bukhman

sea breeze



One of four F-16Cs of the 555th Fighter Squadron involved in the USAF all-domain mission takes off from its home base at Aviano, Italy, July 22 USAF/Staff Sergeant Valerie Halbert

was restricted from all events and media days were not organised this year.

The exercise fleet practised standard tasks – including air defence (AD), anti-submarine warfare (ASW) and search and rescue (SAR) – many being carried out in close co-operation with the air component.

Air component

Just as last year (see Black Sea wargames, December 2019, pages 36-41), the US Navy had provided its P-8A Poseidon aircraft for use in the standard ASW and maritime patrol and reconnaissance tasks. This time the aircraft came from Patrol Squadron 47 (VP-47 'The Golden Swordsmen') based at Naval Air Station (NAS) Whidbey Island, Washington – temporarily detached to NAS Sigonella in



The Ukrainian Navy An-26 s/n '10 Yellow' manoeuvring at low altitude. The aircraft is fitted with four BD3-34 bomb racks on the lower part of its fuselage. These are used for carrying maritime orientation markers during SAR missions Sergey Smolentsev

Sicily, Italy, as part of Task Group TG-67.1 of the Commander Task Force 67 (CTF-67) – supporting US Sixth Fleet operations in the Mediterranean and nearby theatres. In the period July 21-24, at least one P-8A was deployed over the exercise area – including aircraft s/n 168760, 169002, 169328 and 169334.

Similarly, the Ukrainian Armed Forces (ZSU) again provided the major portion of the air

component. This year, the absence of Mi-8s of the Ukrainian Ground Forces (SV) was notable, not only because the SV were not involved in the exercise, but also because the Ukrainian Navy (VMS) now has its own Mi-8s (for more details see Ukrainian Naval Aviation Update, February 2020, p36-38).

The single VMS aviation unit – the 10 mabr, naval aviation brigade from Kul'bakino air base, near Mykolayiv – provided its

two An-26 Curl transports (s/n '09 and 10 Yellow'), the single Mi-14PS Haze-C SAR helicopter (s/n '34 Yellow'), a pair of Mi-14PL Haze-A ASW helicopters (s/n '36 and 37 Yellow') and one of its Mi-8MSB-V Hip combat transport helicopters (s/n '43 Yellow').

All four helicopters were temporarily detached at the Shkil'nyy military apron of Odesa International Airport (IAP) for the duration of the exercise.

The naval An-26 transports were used in standard transport and maritime patrol and reconnaissance tasks, plus also took part in SAR missions along with the Mi-14PS. The two Mi-14PLs were engaged in their standard ASW role, working together with the exercise fleet and the P-8A, while the Mi-8MSB-V was tasked with providing close air support (CAS).

It should be noted that this year



The HC-130J Combat King II CSAR aircraft s/n 14-5864 from 130th RQS/129th RQW of the California Air National Guard refuels over the Black Sea, July 22 USAF/ Staff Sergeant Lexie West



Four USAF F-16Cs of the 510th FS/31st FW at Aviano fly alongside one of the KC-135R tankers of the 351st ARS/100th ARW at RAF Mildenhall during the all-domain mission on July 22 USAF/Senior Airman Benjamin Cooper



Above: The DPSU (State Border Guard Service of Ukraine) DA42 MPP Guardian s/n '22 Blue' aerial surveillance/maritime patrol aircraft returning at Odesa International Airport (IAP) from one of its missions over the Black Sea. The aircraft is fitted with a lightweight FLIR Systems UltraForce 350 electro-optical sensor below the nose Sergey Smolentsev

Below: The Spanish Navy SH-60B Seahawk s/n HS.23-09 of the 010 Escuadrilla from Rota prepares to land at the Shkil'nyy military apron of Odesa IAP, July 22. The helicopter was carried aboard ESPS 'Alvaro de Bazan' (F101) Sergey Smolentsev



live weapons were used by the air component for the first time. The honour went to Mi-8MSB-V s/n '43 Yellow' of the 10 mabr – during a CAS mission on July 23, it had successfully located a maritime surface target, subsequently engaging and destroying it, using its on-board rocket pods, firing 80mm S-8 unguided rockets.

The Ukrainian Air Force (PS) provided a flight of five Su-25 Frogfoot attack aircraft of the

299 tactical aviation brigade, also at Kul'bakino.

The aircraft included single-seat modernised Su-25M1s '40 and 45 Blue' and Su-25M1Ks '32 and 46 Blue', usually operating in pairs, although on at least one occasion they were noted flying as a whole group of five. In addition to playing airborne targets for the fleet's AD systems and providing CAS, they also trained in attacking maritime targets; ▶



Russia flexes while Flankers debut

Due to the high military tensions in the Black Sea region, which were more than evident during the Sea Breeze exercises, a pair of Su-27s was again made available for employment.

This year it consisted of the single-seat Su-27S s/n '24 Blue' from 9 brTA at Ozerne in Ukraine, and the modernised two-seat Su-27UB1M s/n '71 Blue' from 831 brTA – both arriving at Shkil'nyy, part of Odesa International Airport (IAP), on July 20.

As in previous years, all Russian Federation forces in the region – especially those stationed on the nearby Crimean Peninsula, which they occupied in 2014 – were placed on high alert.

Unsurprisingly, the period during a Sea Breeze exercise – as well as immediately before and after it – is a perfect opportunity for US and NATO ISR (intelligence, surveillance and reconnaissance) assets to conduct missions in the Black Sea area.

An RC-135W Rivet Joint aircraft, which arrived from RAF Mildenhall, joined the P-8As involved in Sea Breeze 2020 to perform ISR missions in the area.

As usual, Su-27 fighters of the Russian Air Force, from Belbek air base near Sevastopol, Crimea, appeared on the scene, intercepting two aircraft – s/n 169334 on July 22 and s/n 169328 on July 23 – despite the fact that both of them were flying in accordance with the law over international waters.

To thwart any similar events, on July 23 the two PS Flankers finally made their debut in Sea Breeze – scrambling from Shkil'nyy at approximately 1630hrs local time, they were deployed over the Black Sea. During their two-hour mission, they provided fighter escort for P-8A s/n 169328 and CAP (combat air patrol) over the area where the fleet had conducted anti-submarine warfare (ASW) training, together with the Mi-14PLs and the P-8A. The pair was scrambled again on July 24 – to patrol the area during the traditional photographic exercise event.

The SNMG2 (Standing NATO Maritime Group Two) flagship, the Spanish Navy ESPS *Alvaro de Bazan* (F101) – a frigate of the F100-class, and the Turkish Navy TCG *Yildirim* (F243) – a

Yavuz-class frigate, entered the Black Sea waters on July 9 in the group's second deployment in the area this year.

They were joined by a third ship of the group – the Romanian Navy ROS *Regina Maria* (F222), an ex-British Type 22 Broadsword-class frigate. After participating in a Bulgarian-led maritime exercise with a similar name, Breeze 2020, the group took part in Sea Breeze 2020.

All three ships carried helicopters on board – the ESPS *Alvaro de Bazan* had an SH-60B Seahawk from 010 Escuadrilla at Rota, the TCG *Yildirim* an AB212 ASW from 351 Filo at Cengiz Topel, and the ROS *Regina Maria* had an IAR 330 Puma Naval from Grupul 256 Elicoptere at Tuzla airport near Constanta. All helicopters were active during the group's involvement in both exercises in the region.

On July 22, the SH-60B s/n HS.23-09 took an injured sailor from USS *Porter* to Shkil'nyy. He was then transferred to hospital.

Odesa sidelined

The fact that this Sea Breeze exercise was quite different from earlier iterations was very clear from the almost complete absence of transporter flights arriving at Odesa airport to deliver or collect equipment and personnel taking part in the exercise.

This year, only two aircraft were noted, which is a considerable reduction compared to previous years, when dozens of transport aircraft were involved.

The first aircraft was a USN C-40A Clipper transport – s/n 166694 of Fleet Logistics Support Squadron 56 (VR-56 'Globemasters') at NAS Oceana in Virginia Beach, Virginia. It arrived on July 23 to transport the injured USN sailor from USS *Porter* to NAS Sigonella, Sicily – where this aircraft is temporarily detached in support of US Sixth Fleet operations.

The second aircraft was a USAF C-21A transport – s/n 84-0126 from the 76th Airlift Squadron of 86th Airlift Wing located at Ramstein Air Base in Germany. It arrived at midnight on July 24 to transport a number of Norwegian exercise participants to Bodo Air Station, Norway.



The Su-27UB1M s/n '71 Blue' of 831 brTA at Ukraine's Myrhorod air base returning from an escort mission over the Black Sea, July 23. The aircraft is armed with a pair of IR-guided R-73 air-to-air missiles (AAM) below the wings and four radar-guided R-27ER AAMs below the engine gondolas Sergey Smolentsev

Three Romanian Air Force F-16 fighters of Escadrila 53 Vanatoare ('Warhawks') at the Borcea-Fetesti air base. They had been flying alongside one of three KC-135R tankers of 351st ARS/100th ARW from RAF Mildenhall

USAF/Senior Airman Benjamin Cooper



making some impressive low-level runs over the fleet's ships. The PS also provided a pair of Su-27 Flanker fighters – part of a QRA detachment of four Su-27s from 831 brTA at Myrhorod air base, which is temporarily detached at Shkil'nyy and tasked with defending Southern Ukraine.

Additional assets

Unlike last year, when the pair was also available, but remained in reserve and was not directly involved in the exercise, this time it was activated. It provided combat air patrol (CAP) for the fleet exercise area and a fighter escort for the P-8A aircraft – the latter being another first on a Sea Breeze exercise.

Finally, the State Border Guard Service of Ukraine (DPSU) provided additional assets, all from its Odesa-based independent aviation squadron at Shkil'nyy.

These include Mi-8 Hip transport helicopters and DA40 NG and DA42 MPP Guardian aerial surveillance-maritime patrol



The USAF F-16C s/n 89-2008 from 510th FS/31st FW at Aviano seen here refuelling over the Black Sea from one of the three KC-135R tankers taking part in the all-domain mission on July 22

USAF/Senior Airman Eugene Oliver

aircraft. Most notable DPSU participants were Mi-8MT s/n '06 Blue', tasked with general patrol and transport duties, and DA42 MPP s/n '22 Blue' – the single aircraft of this type operated by the unit and regular Sea Breeze participant tasked with aerial surveillance of the exercise area.

Lastly, the Standing NATO Maritime Group 2 (SNMG2) again participated this year and all three

frigates that took part had a ship-borne helicopter on board.

Stand-out mission

According to official VMS sources, the aircraft that were part of the Sea Breeze 2020 air component had conducted more than 40 flights in total, accumulating in excess of 43 flight hours.

Probably the most notable event this year was the involvement of

the US Air Force (USAF) on July 22, when a so-called all-domain mission was executed over the Black Sea, in co-operation with the USN assets already operating there as part of the Sea Breeze 2020 exercise – the USS Porter (DDG-78), an Arleigh Burke-class destroyer, and the P-8A s/n 169334 from VP-47.

The USAF aircraft involved in this mission included four F-16C Fighting Falcon fighters, three KC-135R Stratotanker aerial refuelling aircraft, at least one MC-130J Commando II transport aircraft and one or more HC-130J Combat King II combat SAR (CSAR) aircraft, plus an undisclosed number of MQ-9 Reaper UASs.

The latter were provided by 52nd Expeditionary Operations Group Detachment 2 from Miroslawiec Air Base in Poland, performing intelligence, surveillance and reconnaissance (ISR) tasks.

The four F-16Cs were provided by the two fighter squadrons (FS) of the 31st Fighter Wing (FW) from Aviano Air Base, Italy – the 510th FS ('Buzzards') and 555th FS ('Triple Nickel').

At least eight aircraft are known to have been involved in missions that day – s/n 88-0444, 88-0521, 89-2008 and 89-2047 from the 510th FS plus s/n 87-0350, 87-0351, 89-2096 and 89-2152 from the 555th FS. However, only those of 510th FS were confirmed as taking part in operations over the Black Sea.

One of the numerous scenarios trained for during this mission included the employment of the AGM-158 Joint Air-to-Surface



The Romanian Navy IAR 330 Puma Naval s/n 140 of the Grupul 256 Elicoptere at Tuzla near Constanta was carried aboard the Romanian Navy frigate ROS 'Regina Maria' (F222) NATO



The view from the cockpit of the MC-130J Commando II transport s/n 11-5737 of the 67th SOS/352nd SOW as it prepares to refuel, July 22 USAF/Staff Sergeant Michael Washburn



The single VMS Mi-14PS, s/n '34 Yellow' of 10 mabr, over the Sea Breeze 2020 exercise fleet, July 24. The ships are (from closest to furthest): Bulgarian Navy ASW corvette 'Bodri' (14); Turkish Navy frigate TCG 'Yildirim' (F243); USN destroyer USS 'Porter' (DDG-78); VMS frigate 'Het'man Sahaydachnyy' (F130); and Romanian Navy frigate ROS 'Regina Maria' (F222) Boris Bukhman

Standoff Missile (JASSM). This is the second time that USAF aircraft have been training in the use of this weapon over the Black Sea this year – the earlier occasion being the May 29 mission performed by a pair of B-1B Lancers from the 28th Bomb Wing at Ellsworth Air Force Base in South Dakota.

The three KC-135R tankers were provided by the 351st Air Refuelling Squadron (ARS), which is part of the 100th Aerial Refuelling Wing (ARW) from RAF Mildenhall in Suffolk.

One of the aircraft – s/n 62-3540 – initially operated over Romanian airspace, before joining the other two – s/n 57-2605 and 58-0100 – in international airspace over the Black Sea, all three conducting aerial refuelling missions in support of the other aircraft participating in the mission.

The MC-130J was provided by the 67th Special Operations Squadron (SOS), part of the 352nd Special Operations Wing (SOW), also based in the UK at RAF Mildenhall.

It exercised in the insertion of special operations forces over the Black Sea waters.

The presence of just one aircraft (s/n 11-5737) has been confirmed beyond doubt, but other aircraft may also have been involved.

Finally, at least one HC-130J aircraft exercising in CSAR scenarios appeared over the Black Sea on July 22 – s/n 14-5864 from the 130th Rescue Squadron (RQS), part of 129th Rescue Wing (RQW) of the California Air National Guard (ANG), based at Moffett Field in California.

This aircraft departed from Aviano and is known to have arrived there the previous day along with a second aircraft of this type – s/n 16-5873 from the 102nd RQS/106th RQW of the New York ANG – stationed at the Francis S Gabreski ANG Base in Westhampton Beach, New York. However, only the presence of s/n 14-5864 has been confirmed.

This mission was not only integrated within the Sea Breeze

2020 exercise, but also conducted in close co-ordination with NATO and the Romanian Air Force.

Three Romanian F-16s of the Escadrila 53 Vanatoare ('Warhawks') from Borcea-Fetesti air base – F-16As s/n 1602 and 1603 and F-16B s/n 1611 – interacted with the four F-16s of the 510th FS and KC-135R s/n 62-3540 over Romania.

A NATO E-3A AWACS airborne early warning and control aircraft, s/n LX-N90444, arrived in from Forward Operating Base (FOB) Aktion in Greece to support the operation in Romanian airspace.

Integrate and operate

The goal of the mission was to provide the opportunity for US forces – as well as for NATO and allied forces that were involved

– to integrate, operate and communicate, while executing jointly all domain operations, demonstrating the high level of readiness, interoperability and deterrence capabilities to discourage potential aggressive actions in the Black Sea area.

A second, identical event was also organised on August 2, although only USAF and USN forces were involved.

Participants included USS *Porter* and P-8A s/n 168760 from VP-47, as well as four F-16Cs, three KC-135Rs and one MQ-9 from the same USAF units as in the previous case.

On this occasion, the F-16Cs were s/n 89-2029 and 89-2047 of 510th FS plus s/n 88-0425 and 89-2023 of 555th FS, while just one of the KC-135R tankers (s/n 57-1440) arrived in from its home base at RAF Mildenhall, with the other two (s/n 58-0100 and 63-8878) being temporarily detached and operating from Rota, Spain. **AFM**

The MC-130J Commando II transport s/n 11-5737 from the 67th SOS/352nd SOW at RAF Mildenhall performing low-altitude flying manoeuvres close to the USN destroyer USS 'Porter' during an all-domain mission, July 22 USN

Report released on Reaper crash in Afghanistan



Above: An MQ-9 Reaper arrives at Kandahar Airfield, Afghanistan, on January 18, 2018 USAF Staff Sgt Sean Martin

US AIR Force Air Combat Command has made public the Abbreviated Aircraft Accident Investigation report into the loss of an MQ-9A Reaper in Afghanistan on October 27, 2018 (see 'Attrition', January 2019, p89). Note the correct date – it was originally reported as having crashed on October 28.

The Executive Summary of the report states that, on October 27, 2018, at approximately 1300 local time (L), the mishap aircraft (MA), an MQ-9A, tail number (T/N) 12-4174, assigned to the 432nd Wing at Creech Air Force Base, Nevada, crashed approximately 142nm (263km) from the airfield in an undisclosed location within the United States Central Command area of responsibility. A US Army official later confirmed that it had come down in Paktika Province, Afghanistan. At the time of the mishap, the 42nd Attack Squadron mission control element was in control of the MA. Loss of Government property is valued at \$13,788,693. There were no reported fatalities, injuries or damage to civilian property.

The crew consisted of the Mishap Pilot (MP1) and Mishap Sensor Operator (MSO). Prior to MP1 taking over the MA, the mid-shift Mishap Pilot (MP2) observed several issues in the MA: the exhaust gas temperature (EGT) fluctuated between the minimum and maximum operating range at a larger gap than MP2 had

previously seen, and the EGT had once gone below the normal operating range by two to five degrees for approximately five to 10 seconds. However, MP2 did not notice any changes to the revolutions per minute (RPM) speed or any other indicators that suggested to him that the engine was faulty. Additionally, the flight control station's tracker display, which is the top monitor in the MA, was not properly displaying any maps and the MA was not visible on the tracker display. Without the ability to move the maps in the MA, MP2 was unable to update his emergency mission route of flight. Emergency mission dictates where the aircraft flies if the aircraft goes lost link. Given the location of the MA, MP2 was concerned with the possibility of losing the aircraft.

After conferring with air traffic control, MP2 sent the MA in a lost-link orbit, in order to determine what caused the issue in the MA's flight control station. Ground control station (GCS) maintenance personnel managed to get the MA back on the tracker display, but the maps were still not visible. GCS maintenance also determined that the solution was to reset the MA's rack, which is the console where the pilot controls the aircraft. MP1 agreed with the proposed plan and entered the GCS. At approximately 0830L, MP1 performed the standard gaining checklists in order to gain

control of the MA, along with the rack configuration and pre-sets checklists to ensure the rack and parameters for the MA were set up correctly. A period of lost datalink occurred due to the rack swap.

MP1 successfully re-established link with the MA and the MA appeared to be functioning normally. However, a yellow '[Digital Electronic Engine Control (DEEC)] – sensor fault' caution message appeared on the heads-down display (HDD). This caution is normally associated with a 'DEEC in Backup Mode' warning, which would flash on the HDD in red. That second indicator did not appear on the MA screen. MP1 ran the appropriate checklist and, based on indicators he observed in the MA, believed that the DEEC mode was active. MP1 determined this caution was an anomaly and elected to stay on course.

For the next 3½ hours, from approximately 0900L to 1230L, the flight was uneventful. At approximately 1230L, the MSO came on shift and MP1 set the MA in orbit to fly itself, while he began documenting the DEEC sensor fault discrepancy in Skynet. MP1 noticed the EGT fluctuating rapidly. Torque and propeller speed began to decrease, resulting in an uncommanded descent. MP1 attempted several automatic and manual engine restarts, but was unsuccessful. The engine continued to combust, but engine torque could not be restored.

Ultimately, MP1 was forced to make an emergency landing in a relatively clear mountainous range area. The MA was destroyed and not available for inspection.

Mishap hardware was not available for inspection as the unrecovered MA was destroyed. However, the MCE classified data logs from the GCS were sent to GA-ASI for review. Data log analysis indicated the loss of engine torque was caused by a decoupling of the propeller from the engine. After this occurred, the data logs confirm the DEEC and Engine and Fuel Interface Unit (EFIU) indicated different, but accurate, speeds, which is only possible if the propeller is decoupled from the engine. Without an analysis of the hardware, GA ASI could not confirm the root cause of the decoupling, but they determined that it was most likely the result of a failed spiral retaining ring (also known as the spiral lock ring) inside the gearbox. The spiral retaining ring has a history of excessive wear and failure.

The Abbreviated Accident Investigation Board President found, by a preponderance of the evidence, the mishap was caused by: (1) the decoupling of the propeller from the engine, and (2) MP1's failure to adequately follow the DEEC sensor fault checklist. There was insufficient evidence indicating any substantially contributing factors.

Accident Reports

D: Jan 23

N: Indian National Cadet Corps

T: Zenair STOL CH701

This aircraft made an emergency landing at around 1200hrs local time on the Eastern Peripheral Express Highway near Sadarpur village in the Masoori police station area, Ghaziabad, Uttar Pradesh state. The port wing was extensively damaged and partially torn away when it hit a crash barrier at the side of the road, and the nose undercarriage leg was bent sideways by about 45°. The two pilots were unhurt and were recovered by an Indian Air Force search and rescue helicopter from Hindon Air Force Station. The aircraft caused a major traffic jam on a busy stretch of the highway between the Masoori and Murad Nagar areas of Ghaziabad district.

D: Mar 31

N: Indian Air Force

T: HAL HS748M Subroto

During the initial climb out after take-off from Agra-Kheria Air Force Station, one of the engines caught fire at a height of 250ft. The aircraft immediately returned and made a safe single-engine emergency landing without injury to the two crew. The engine and surrounding nacelle sustained extensive fire damage, with a large section of the latter completely burnt away.

D: Apr 16

N: Indian Air Force

T: HAL HAL315B Cheetah

While en route from Hindon to Chandigarh on a COVID-19 mission to carry test samples from Leh, the helicopter developed a technical problem approximately 3nm (5.5km) from Hindon. A safe precautionary landing was made on the Outer Ring Road. There was no damage to property on the ground and a recovery operation was immediately launched from Hindon. After the problem had been rectified in situ, the Cheetah was flown safely back to Hindon.

D: Apr 21

N: South African Air Force/
28 Squadron

T: C-130BZ Hercules

S: 405

During start-up of No 2 engine, while stationary on the ramp at Air Force Base Waterkloof prior to a test flight, the nose undercarriage



Above: Libyan National Air Force Mi-8T 8107 being recovered after being captured on September 7 by Libyan Government of National Accord forces following an emergency landing at Abu Grein, west of Sirte. The pilot reportedly survived, but fled the scene to avoid being taken captive. Damage to the airframe included smashed cockpit glazing and a broken tail rotor. After being captured, it was transported on the back of a flatbed truck to Misrata Air Base GNA

unexpectedly retracted and the underside of the forward fuselage hit the tarmac and may have been damaged. No injuries were reported. Any damage which may have been incurred had been repaired by May 2, when the aircraft made a test flight from Waterkloof. The following day, 28 Squadron was due to carry out an acceptance check prior to the aircraft returning to service.

D: Apr 22

N: Ukrainian Air Force/15 BrTrA
T: Mi-8MSB-W

During an extremely low-level combat training flight, along with several other Mi-8s, all flying in pairs, this helicopter had a suspected bird strike which

resulted in failure of one engine.

The crew managed to make a safe, emergency, single-engine landing at around 2200hrs local time in an open field near the settlement of Ivankiv, Kyiv region. No injuries were reported and the Mi-8 did not appear to have sustained any serious damage.

D: Jun 12

N: Guyana Defence Force
T: BN-2A-21 Islander
S: 8R-GRM

After departing from Mabaruma for the GDF Air Station at Cheddi Jagan International Airport, one of the aircraft's engines failed and a force-landing was carried out at Bimichi, North West District. There was no serious damage or injuries.

After repairs on site it was flown back to its base.

D: Jun 15

N: US Air Force/48th Fighter
Wing/492nd Fighter
Squadron 'Mad Hatters'

T: F-15E Strike Eagle

S: 91-0316 'LN'

In a separate incident to the previously reported loss of 86-0176 on this date, this aircraft, which had also been training over the North Sea, declared an emergency at 1143hrs local time due to a cracked cockpit canopy. The aircraft returned home for a safe landing at RAF Lakenheath, Suffolk, where fire engines awaited by the runway as a precaution.

D: Jun 18

N: Royal Netherlands Air
Force/301 Squadron

T: AH-64D Apache

S: Q-30

Due to a problem with one of the engines, this helicopter made a precautionary landing in a farm field near the village of Eeten. No injuries to the crew or damage to the airframe were reported. Within a couple of hours, mechanics had solved the problem in situ and it was able to fly back to its base at Gilze-Rijen.

D: Jun 26

N: Indian Air Force

T: HAL315B Cheetah

While en route from Hindon to Halwara on a routine mission, this helicopter developed a technical snag and carried out



Above: Close-up of Royal Canadian Air Force CH-149 Cormorant 149911 at Saglek Airfield, Newfoundland and Labrador, on September 16, showing a window that was punched out by a polar bear and muddy paw prints on the fuselage RCAF

Abbreviations: D: Date N/U: Nationality/Units T: Type S: Serials



Above: Afghan Air Force MD530F Cayuse Warrior 283 after its crash into a river in the Kaparak area on September 24. Both crew members, Major Besmullah and Second Lieutenant Faisal, were killed Pakistan Defence Command

a precautionary landing on the Eastern Peripheral Expressway, approximately 14nm from Hindan. The crew were uninjured and, after on-site repairs, it was able to fly out again safely.

D: Jun 29
N: Russian Air Force
T: MiG-29 Fulcrum

On September 11, US Africa Command deputy intelligence director Rear Admiral Heidi Berg revealed this previously unknown loss. The aircraft crashed while operating in Libya, possibly while being flown by a Russian pilot from the paramilitary contractor, the Wagner Group.

D: Jun 30
N: US Air Force/77th FS
T: F-16CM
S: 00-0221 'SW'

Updating the previous report of the crash of this aircraft at Shaw Air Force Base, South Carolina (see 'Attrition', September, p89), the serial number of the F-16 involved is now known, as given above.

D: Aug 23
N: US Navy/VAW-116 and VFA-22
T: E-2C and F/A-18F

While attempting to land on the USS *Nimitz* (CVN 68) at around 1630hrs local time in the North Arabian Sea, a Hawkeye from Carrier Early Warning Squadron 116 (VAW-116) 'Sun Kings' made a hook skip bolter after failing to catch the arrestor wires and made a go-around. It hit a parked F/A-18F Super Hornet of Strike Fighter Squadron 22 (VFA-22) 'Fighting

Redcocks' resulting in damage to both aircraft. One wing of the Hawkeye struck the fin of a CATM-9X (captive air training missile) on the parked Super Hornet. There were no injuries, but the incident was classified by the US Naval Safety Center as a Class A mishap, indicating more than \$2.5 million of damage. Both aircraft were repaired and returned to full operational status.

D: Aug 31
N: US Navy/VAW-120
T: E-2C Hawkeye
S: 166503 '622'

Updating the previous report of the loss of this aircraft near Wallops Island, Virginia (see 'Attrition', October, p91), the serial of the Hawkeye is now given above.

D: Sep 4
N: Chinese PLAAF/5th Air Brigade
T: Chengdu J-10?

This aircraft crashed about 6km northwest of Guilin (Li Chia Tsun) Air Base following a suspected technical malfunction. It came down in Sanjia village, Guilin Qixing district, Guangxi province. It was unclear if the pilot ejected before the crash. The type is unconfirmed, but believed correct, as the J-10 is the only type based at Guilin.

D: Sep 7
N: Libyan National Air Force
T: Mi-8T
S: 8107

This helicopter was captured by Libyan Government of National Accord forces after making an emergency landing at Abu Grein,

west of Sirte. The pilot reportedly survived but fled the scene to avoid capture. Damage to the airframe included smashed cockpit glazing and a broken tail rotor. After being captured, it was transported on a flatbed truck to Misrata Air Base.

D: Sep 10
N: US Navy
T: F/A-18F Super Hornet

Following a fire in the No 2 engine, the crew made an emergency landing at Naval Air Station Oceana, Virginia. Although there were no injuries reported, the US Naval Safety Center classed the incident as a Class A mishap, indicating more than \$2.5 million-worth of damage.

D: Sep 15
N: Pakistan Air Force/33 Tactical Wing
T: JF-17 Thunder
S: 17-241

This aircraft was destroyed in a crash in an open area of the Pindigheb area of Attock district, while on a routine training flight from PAF Base Kamra-Minhas. The pilot ejected safely. The JF-17 came down in an open area and there were no injuries on the ground. It is believed the aircraft lost was from 14 Squadron 'Tail Choppers'.

D: Sep 16
N: Royal Canadian Air Force/413 (Transport and Rescue) Squadron
T: CH-149 Cormorant
S: 149911

Due to poor weather at its planned destination, the helicopter made a precautionary landing at Saglek Airfield, Newfoundland and Labrador. At some point while

parked overnight, an inquisitive polar bear pushed on a side door, popped out an emergency exit window and removed a small cover panel on the nose. There were no crew members near the helicopter at the time. After inspecting the damage, it was deemed superficial and was repaired on site.

D: Sep 16
N: Philippine Air Force/505th Search and Rescue Group
T: Sikorsky AUH-76A
S: 202

This search and rescue helicopter was destroyed when it crashed at around 1300hrs local time in bad weather at Barangay Upper Mangas village near Lantawan town, Basilan province. All four on board were killed. The AUH-76 was en route from Jolo to Zamboanga to evacuate a civilian blast victim. The helicopter had departed for the mission at 1233hrs and was due to return to the Western Mindanao Command helipad.

D: Sep 22
N: Russian Air Force/3rd Mixed Aviation Regiment
T: Su-30M2
S: RF-95869 '60 Red'

This aircraft, from the Southern Military District base at Krymsk, crashed in a forested area near the village of Dornikovo, 40km from Vyshny Volochok, during a routine air combat training (ACT) flight near Khotilovo Air Base in the Tver region. The two crew members ejected safely and were recovered to their base. The aircraft had been hit by 30mm GSh-301 cannon fire from an Su-35S from the 790th Fighter Aviation Regiment at



Above: Wreckage from an Azerbaijan Air Force Mi-8/17 helicopter, which Armenia claimed to have shot down near Tartar on September 27 Armenian Govt

Khotilovo during ACT after its pilot fired off a burst from the cannon to record the kill, not knowing that live ammunition had accidentally been left in the gun after an earlier combat sortie.

D: Sep 23
N: Libyan National Army
T: Mi-?? helicopter

While carrying a cargo of weapons and ammunition, this helicopter was destroyed when it crashed and exploded at around 0800hrs local time in the Sukna area near Al Jufrah Air Base in central Libya, shortly after take-off. All four crew members were killed. The crew were Russian operatives from the Wagner Group and were flying to one of the oil fields used as an operations base, possibly either Tamanint or Brak Al-Shati.

D: Sep 24
N: Afghan Air Force
T: MD530F Cayuse Warrior
S: 283

This helicopter crashed in the Kaparak area of Pul-e Khumri city, Baghlan, due to a technical problem. Both crew members, Major Besmullah and Second Lieutenant Faisal, were killed.

D: Sep 25
N: Serbian AF&AD/101st Sqn
T: NL-16 (MiG-21UM)
S: 16185

Both pilots died when this aircraft crashed in the village of Brasina, between Loznica and Mali Zvornik, at 0910hrs local time, during a routine training flight from Batajnica Air Base. The aircraft came down in the yard of a local man who was seriously injured during the crash. The two crew

members who died were Major Dejan Krsnik and Captain 1st Class Zvonko Vasiljevic. The aircraft was the last operational MiG-21 in Serbian service and had only been overhauled and returned to flight status in May this year after being grounded since May 2018.

D: Sep 25
N: Ukrainian Air Force/203 Aviation Training Brigade
T: An-26Sh
S: '76 Yellow'

While performing circuit training at Chuhuiv (Chuguyiv) Air Base, on its sixth approach to runway 16, the aircraft crashed at approximately 2050hrs local time on the E40 highway, 2km from the airfield, burst into flames and was destroyed. All seven crew members and 18 of the 20 passengers, who were all cadets from the Ivan Kozhedub Kharkiv University of the Air Force, were killed. The two survivors were taken to hospital, but one later succumbed to his injuries. Unconfirmed reports suggest a sensor in the No 1 engine failed, although the engine was still developing power at the time of the crash.

D: Sep 27
N: Azerbaijan Air Force
T: Mi-8/17

During renewed hostilities which flared up between Armenia and Azerbaijan over the breakaway state of Nagorno-Karabakh (also known as the Republic of Artsakh), this helicopter was shot down by Armenian defence forces and crashed near Tartar. The Azerbaijan Defence Ministry said that all of the crew had survived but the helicopter was destroyed.



Above: Wreckage from an Armenian Su-25 Frogfoot which was shot down near Vardenis on September 29 Armenian Ministry of Defence

D: Sep 27
N: Azerbaijan Air Force
T: Unidentified UAV

This UAV was reportedly shot down over Stepanakert, the capital of Nagorno-Karabakh.

D: Sep 28
N: Azerbaijan Air Force
T: Antonov An-2

The Armenian Ministry of Defence claimed that an Artsakh Defence Army unit had shot down this aircraft near the town of Martuni, during hostilities between Armenia and Azerbaijan over the breakaway state of Nagorno-Karabakh (also known as the Republic of Artsakh). A video and photos showed it to be completely burnt out.

D: Sep 29
N: Armenian Air Force
T: Su-25 Frogfoot

This aircraft crashed at around 1030hrs local time near Vardenis, Armenia, during the conflict between Armenia and Azerbaijan over the breakaway state of Nagorno-Karabakh. The pilot, Major Valeri Danelin, was killed. Armenia claimed it was shot down by a Turkish Air Force F-16, but Turkey denies involvement. One report said it was shot down by an Azerbaijan Air Force MiG-29 Fulcrum, but this is unconfirmed.

D: Sep 29
N: US Marine Corps/VMGR352 (KC130J) and VMFA121 (F35B)
T: KC130J and F35B
S: 166765 'QB765' (KC130J) and ??

During an air-to-air refuelling mission over southern California, the F-35B, callsign 'Volt 93,'

collided with the KC-130J, callsign 'Raider 50,' at around 1600hrs local time. The pilot of the Lightning II ejected safely, sustaining only minor injuries, before the aircraft was destroyed when it crashed and exploded into flames close to Salton City, between Highway S-22 and Holly Road. The KC-130J, with eight personnel on board, reported to ATC immediately after the collision that he had lost two engines, was leaking fuel and may be on fire, but was able to maintain partial control and was looking for the nearest airfield to make an emergency diversion into. The crew made an emergency landing in an open ploughed field just north of the Salton Sea, Imperial County, near Polk Street and 59th Avenue, close to Jacqueline Cochran Regional Airport, Thermal. There were no injuries reported to those on board. The aircraft came to rest with all the propellers sheared off from both starboard outboard engines and the tips of all propellers on the port outboard engine also torn away. The refuelling pod, normally mounted between the No 3 and 4 engines, had also been torn away. The KC-130J was based at Marine Corps Air Station Miramar, California, while the F-35B was from MCAS Iwakuni, Japan. Both aircraft were operating from MCAS Yuma in Arizona, as part of a Weapons and Tactics Instructor course.

Additional material from:
 Igor Bozinovski, Donny Chan, Scramble/Dutch Aviation Society, Vladimir Trendafilovski, René L. Uijthoven and Asagiri Yohko. [AFM](#)



Above: The burnt-out remains of an Azerbaijan Air Force Antonov An-2 which the Armenian Ministry of Defence claimed had been shot down by an Artsakh Defence Army unit near the town of Martuni on September 28 Armenian Govt

A KC-747 flying with an MiG-29UB, an F-4E, and a F-14A during Iran's Military Day annual on April 18, 2015
Keyvan Tavakkoli



Iran's *ageing icon*

For the past 45 years, the Islamic Republic of Iran Air Force has been operating a fleet of Boeing 747 strategic airlifters in both military and civilian roles. **Babak Taghvaei** explores the chequered history of the fleet



The Islamic Republic of Iran Air Force (IRIAF) has been the world's sole operator of the Boeing 747 for its cargo and aerial refuelling purposes since 1975.

Today, the air force has a fleet of 10 examples in service with its Boeing 747 squadron based at Mehrabad International Airport in Tehran. Their roles vary from refuelling McDonnell Douglas F-4E Phantom IIs to transporting military equipment and personnel, as well as civilian cargo such as relief aid.

Of the 10 Boeing 747s, just three are operational, mainly due to the IRIAF's lack of a budget to speed up maintenance overhauls or procure spare parts for the aircraft in storage. It is a situation the IRIAF needs to address, especially in light of the Israeli Air Force's ultra-lethal capability.

The Iran-Iraq War

When Iraq invaded Iran on September 22, 1980, the Iraqi Air Force conducted a massive aerial operation named 'Qadessiya' to disable key runways and facilities of eight of the IRIAF's bases, plus one Iranian Army Aviation (IRIAA) air base and a civilian airport. A fleet of four Tu-22B heavy bombers from Iraq's 36 Squadron from Tammuz Air Base bombed the 1st Tactical Fighter Base and Transport Base at Mehrabad International.

As a result of the surprise attack, three Boeing 707-3J9C (KC-707) tankers were slightly damaged by shrapnel, while a further KC-707 was heavily damaged and another was destroyed, along with a C-130E. A Boeing 747-131F with serial number 5-8106 was also damaged by shrapnel, but was repaired in just a few days. To protect the Boeing 707s and



On September 17, 2018, this 747-219F was damaged after a nearby shipment of weapons exploded after being targeted by a Delilah cruise missile at Damascus International Airport Keyvan Tavakkoli



747s from any further airstrikes, the IRIAF deployed them to Mashhad air base, northeast of Tehran, as well as to Karachi in Pakistan for several months. Only two Boeing 707s and two Boeing 747s were kept at Mashhad to perform refuelling and cargo missions.

The IRIAF's Boeing 747s played a crucial role during the Iran-Iraq war. Their main missions were inflight refuelling and logistical support. Between September 27-29, 1981, for example, the Iranian Army Ground Force (IRIGF) launched the offensive operation Samen-ol-A'emeh ('Eighth Imam') which led to breaking the Iraqi siege of Abadan and liberating all occupied villages and lands around the Khuzestan province in southwest Iran.

This operation was carried out by almost 40,000 Iranian troops – among them were

15,000 from outside the city. Only a few hours before the operation's launch, the IRIAF's Boeing 747-131Fs airlifted thousands of soldiers of IRIGF's 77th Infantry Division from Mashhad in the northeast to Omidyeh in the southwest of Iran.

In order to gain Syria's support in the war against Iraq, the Islamic Regime authorities decided to send Islamic Revolutionary Guard Corps (IRGC) troops to Syria to help the Syrian Arab Army in its own battle against Israel in the 1982 Lebanon War. For this purpose, hundreds of Islamic extremists, mostly from the IRGC and led by commander Mostafa Chamran, were flown aboard IRIAF Boeing 747-131Fs to the capital Damascus, and from there entered Lebanon. A former Iranian ally during the secular government of Pahlavi, Israel was now a prime target for

the Islamic fundamentalists who were ruling Iran.

After the war

In 1990, after the formal establishing of Saha Airlines – wholly owned by the IRIAF – it was decided that the 5-8103 and 5-8105 should join the airline a year later, in March and November 1991. They received civil registration codes EP-SHC and EP-SHD respectively, and were used for both military and civilian purposes.

Due to limited budgets, the maintenance and overhaul costs of the Boeing 747 fleet were mostly being funded through the income from civilian cargo flights. Despite this, the number of airworthy Boeing 747s of the IRIAF was gradually reduced to just five, comprising three Boeing 747-131F tanker aircraft (serial numbers 5-8103, 5-8105 and 5-8107) and two Boeing 747-2J9Fs (serial numbers 5-8114 and 5-8115). Meanwhile, 5-8116 departed for service with Iran Air as EP-ICC, until it was retired in 2002.

IRIAF commanders celebrated a brief achievement in performing Boeing 747 heavy maintenance 'D-checks' in the late 1990s. However, due to mismanagement, a lack of budget and the widespread early retirement of high-ranking personnel, including the engineers and technicians, the IRIAF's aircraft and helicopter fleet combat readiness was lowered significantly.

The Boeing 747 fleet was hit particularly hard and, as a result, all of the aircraft were grounded except for just one Boeing 747-131F

On August 16, 2020, this former Iraqi Airways 747-270C was damaged due to negligence by technicians during engine testing at Mehrabad Airport Ali Naderi



'The IRIAF's Boeing 747s played a crucial role during the Iran-Iraq war'



The 747-2J9F can be seen during take-off from 29L Runway at Mehrabad International in February 2019 Keyvan Tavakkoli



(serial 5-8102) and one KC-747 (serial 5-8103) active between 2002 and 2005.

In addition, overhauls of the JT9D-7A engines had been stopped since the mid-1990s under pressure from the United States. Subsequently, IACI's plant No.2 had to carry out maintenance of these Pratt & Whitney turbofan engines.

Civilian Boeings go to war

In 1988, following the Iran-Iraq War and just before the start of Persian Gulf War in 1990, Iraq's then dictator, Saddam Hussein, ordered the relocation of more than 140 military and civilian aircraft from Iraq to Iran in order to safeguard them from airstrikes during Operation Desert Storm, the US-led coalition operation to expel Iraqi forces from Kuwait, which Iraq had invaded in August 1990.

A month prior to the relocation of Iraqi Air Force aircraft to Iran, Iraqi Airways had five of its passenger aircraft plus an Iran Air Boeing 727-286C (EP-IRP), a Falcon 20E from Iran Aseman Airlines (EP-FIF), as well as five ex-Kuwait Airways Airbus A310-222 passenger aircraft, which Iraqi Airways had seized after the occupation of Kuwait. The five Iraqi Airways aircraft were a Boeing 707-370C (YI-AGG), two Boeing 737-270Cs (YI-AGH and YI-AGI) and two Boeing 747-270Cs (YI-AGN and YI-AGO).

Decisions were made to put these aircraft into service as a part of multi-billion-dollar compensation package, which Iran was seeking from Iraq over starting the war in September 1980. The 737-270Cs and one



Former Iraqi Airways 747-270C undergoing its depot maintenance or D-check at the FARSCO installation centre in February 2017 Mehrad Watson


of the 747-270Cs (registered YI-AGO) were delivered to Iran Air, while the 707-370C and the 747-270C (YI-AGN) entered IRIAF service and received 5-8315 and 5-8106 registrations respectively. After a year, the YI-AGO was also returned to IRIAF, after Iran Air failed to operate it for Hajj flights abroad, as a result of the Iraqi government filing a complaint with the United Nations for seizure of the aircraft and requesting their return.

YI-AGN continued to serve with the IRIAF and, because it had a full passenger configuration cabin, was used by Saha Airlines to fly civilians between Tehran and Mashhad during peak seasons in spring and summer. It also helped transport IRIAF personnel and their families between bases. It's interesting

to note that the IRIAF has retained the original Iraqi Airways branding inside the cabin.

Airworthy 747s

In 2005, the Islamic Regime authorities could foresee a danger of upcoming war with the US and Israel over its controversial nuclear ballistic missile production programme. The IRIAF budget was increased, which helped to fund the overhaul of its Boeing 747s at the FARSCO aircraft maintenance, repair and overhaul centre in Tehran.

At that time, IRIAF's Boeing 747 squadron had only two airworthy aircraft, a Boeing 747-131F freighter (5-8102 serial number, c/n 19678/78) and a Boeing 747-131F tanker (5-8103 serial number, c/n 20080/80). 



There was also a heavy maintenance D-check of another Boeing 747-131F freighter (5-8108 serial number, c/n 19669/9) in 2003.

FARSCO was contracted by the IRIAF to perform the overhaul of the 5-8105 (KC-747) and the 5-8106 (747-270C) in 2006. They were both delivered back to the Boeing 747 squadron in 2007. Following these, another KC-747 (5-8107, c/n 20082/151) was overhauled by FARSCO and redelivered to the IRIAF in 2008. As a result, all three KC-747s, as well as the IRIAF's 5-8106 and 5-8108, were deemed airworthy in 2009.

The IRIAF then started the overhaul of one of its three Boeing 747-2J9Fs (5-8115 serial number), which entered the Revolution hangar of the 1st Tactical Transport Base on August 13, 2008.

Avionic upgrades

In order to fly in international airspace, it was mandatory for the IRIAF to equip its cargo aircraft with traffic alert and collision avoidance systems (TCAS) to meet standards set by the International Civil Aviation Organization (ICAO).

Back in 2002, the IRIAF's Self-Sufficiency and Industrial Research department upgraded the avionics of the 5-8115 (EP-SHH), during which they had almost 15km of wires replaced in the aircraft. As a part of the upgrade work, the aircraft was equipped with an airborne

collision avoidance system (ACAS) and, to further meet ICAO standards, received a complementary avionics upgrade during its D-check in 2009.

During the upgrade work, the aircraft was equipped with TCAS II, a ground proximity warning systems (GPWS), plus a new U/VHF radio, flight management system (FMS) and a digital scope for its weather radar.

The world's oldest jumbo, the Boeing 747-131F (5-8101, c/n 19667), was the next IRIAF aircraft to undergo similar upgrades. The 5-8101 was delivered to FARSCO on August 8, 2008. Its overhaul and D-check lasted until 2010, when it passed all its ground and flight tests successfully. The aircraft was redelivered to the IRIAF in April 2012. A few months before this, in January 2012, the upgrade work of the 5-8115 had finished and the aircraft was already in use for transporting civilian and military cargo from Tehran to Damascus.

Back to life

Following the deadly crash of Israel's El Al flight 1862 into the Groeneveen and Klein-Kruitberg flats in Amsterdam on October 4, 1992, resulting in the deaths of 43 people, the Boeing company issued a technical directive for all Boeing 747 operators to have the pylons for their engines modified to avoid similar accidents. It is believed the crash was caused

by fatigue failure of an engine fuse-pin in the pylon of the third JT9D-7J turbofan engine. The IRIAF managed to get all the technical parts for the pylons of the JT9D-7A engines of its 747-131Fs, but it was not at first possible to find the kits for the pylons of JT9D-F engines of the 747-2J9Fs, due to international sanctions having been imposed in the late 1990s.

Finally, the IRIAF obtained the kits for the 5-8115. Two further sets of kits were obtained for the 5-8113 and 5-8114 and, as a result, their D-checks were started in 2013 and 2014 respectively. At the same time, they also received an avionics upgrade package similar to the 5-8101 and 5-8115.

However, during their overhaul, both aircraft sustained damage due to negligence of the maintenance crew and technicians. The flight deck of the 5-8113 caught fire by mistake in May 2014, which delayed its overhaul for an entire year. The 5-8114 also had its empennage slightly damaged during a nose landing gear change, when the tail of the aircraft hit a ramp in front of the overhaul hangar on September 7, 2014. Both were eventually redelivered to the IRIAF by 2018.

Syrian express

In addition to Air Syria's Il-76Ts, Iranian cargo aircraft have played a key role in the transportation of civilian and military goods

Boeing 747-131F prior to its maintenance overhaul in November 2003 Ali Naderi



On September 15, 2017, this 747-2J9F airlifted 40 tons of food, medicine and sanitary equipment from Tehran to Dhaka in Bangladesh, to help the plight of Rohingya refugees Ali Naderi



The boom operator window of the KC-747. This aircraft is now under maintenance overhaul in the Revolution hangar of the IRIAF's 1st Tactical Transport Base Keyvan Tavakkoli



One of three KC-747 heavy tanker aircraft of the IRIAF's Boeing 747 fleet prior to departure at Mehrabad Airport in February 2013. This aircraft is now in storage Babak Taghvaei

from Tehran. These included two 747-281Bs of Fars Air Qeshm, with the civil registrations of EP-FAA and EP-FAB, and also the IRIAF's 747-131F (5-8101 serial number) and 747-2J9F (5-8115 serial number).

In order to operate in International airspace under cover of being civilian aircraft, the 5-8101 received EP-AJT and the 5-8115 was given EP-AJI civil registers under AOC of Meraj Airline. However, this company was a state-run airline belonging to the Islamic Republic hangar of IRIAF. This led to Meraj Airlines having sanctions imposed upon it by the US Treasury Department.

In addition to transporting civilian and military cargo to Syria, both 5-8101 and 5-8115 were used to airlift heavy military equipment and weapons from Tehran to Erbil International Airport in Iraq's Kurdistan, to be delivered to Peshmerga forces including guerrillas of the PUK (Patriotic Unity of Kurdistan) in September 2014. These weapons were used by the Peshmerga forces in the war against the so-called Islamic State in the Sinjar area and thereafter for operations near Mosul in northern Iraq.

Damascus attack

Following the defeat of Islamic State in the territories under the control of the Syrian government, particularly those entrenched in the south close to the Golan Heights, the IRGC decided to change its strategy and begin constructing military bases and weapons storage facilities in preparation for a possible future war with Israel. This resulted in an increase in Israeli Air Force strikes against IRGC-related targets in Syria. One of these included a shipment of weapons that were being transferred by the Boeing 747s from Tehran to Damascus.

In the early hours of September 17, 2018, the recently overhauled 5-8113 landed at Damascus International Airport, carrying

an unknown military shipment on board. In response to this, the Israeli 109th 'The Valley' Squadron had its F-16D Block 40 Barak fighters scrambled on a mission to destroy the cargo before it could leave the airport. Using at least two Delilah cruise missiles, the shipment was destroyed by the Israeli aircraft while it was still sitting alongside the 747-2J9F. The shrapnel and fire from the explosion resulted in damage to the aircraft's nose section, leading edge flaps, nose landing gear and bay doors.

To repair the 5-8113, the IRIAF sent a team of technicians and engineers to Syria, who worked for nearly two months to temporarily patch every hole in the aircraft's fuselage. The IRIAF's 707-3J9C also transported a JT9D-7F turbofan engine from to Damascus to replace the No.2 engine of the 5-8113, which had been damaged during the air strike. After its eventual return to Tehran on November 20, 2018, the 5-8113 was sent for major repairs.

Disaster relief operations

In addition to their military usage, the current fleet of three active and airworthy Boeing 747 tanker and cargo aircraft of the IRIAF have also been extensively deployed to perform humanitarian relief operations both inside and outside the country.

On November 13, 2017, just a few hours after a major earthquake struck Kermanshah in the western part of Iran, the Boeing 747-131F airlifted several tons of relief aid to Kermanshah airport. Less than a year later, on April 2, 2018, the Boeing 747-2J9F airlifted 50 tons of relief aid from Tehran to Ahvaz to help communities affected by the flooding of Khuzestan province.

In addition to such emergency disaster relief operations, the Boeings have also been used for humanitarian missions. The Boeing 747-131F was used to transport relief aid from Iran's Red Crescent to Pakistan during the

floods of September 2010. Another recent example happened on September 15, 2017, when Boeing 747-2J9F airlifted 40 tons of food, medicine and sanitary equipment from Tehran to Dhaka, Bangladesh, to help the plight of Rohingya refugees.

The most recent incident occurred in 2020. After a massive explosion decimated the area around the port of Beirut on August 6, the 5-8113 was used to airlift 40 tons of relief aid from Tehran to Lebanon.

Fate of the fleet

In February 2012, the IRIAF purchased a 35-year-old Boeing 747-238B from the FARSCO centre. The aircraft was later used as a source of spare parts during the overhauls of 5-8113 and 5-8114. In addition, the IRIAF has been using YI-AGO, a former Iraqi Airways Boeing 747-270C, as source of spare parts since 2006.

As of August 2020, the IRIAF had three more Boeing 747s – 5-8107, 5-8115 and 5-8106 – undergoing D-checks. The examination of 5-8106 was completed in mid-August and the aircraft was towed to a 'hotspot' area at Mehrabad International Airport for engine tests. However, due to the negligence of technicians, the aircraft hit a fence during testing on August 16, resulting in significant damages to all four engines, the nose section and the leading edge flaps.

In addition to these Boeing 747s, the IRIAF has a fleet of six Il-76TD heavy cargo aircraft in service of its 71st Tactical Transport Squadron in the 7th Tactical Fighter Base at Shiraz in southern Iran. It also has 20 C-130Es and 15 C-130H medium-sized transport aircraft in service of the 11th, 12th and 72nd Tactical Transport Squadrons, and 13 Fokker 27-400M/600 light transport aircraft in service of the 11th F-27 Squadron. However, at the time this article was written, only three Il-76TDs, 15 C-130E/Hs and three Fokker 27s were considered airworthy. **AFM**

One of three Iranian KC-747s landing at Mehrabad Airport in Tehran Ali Kashani



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